THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXII. No. 1597.] LONDON, DECEMBER 19, 1893. [45TH YEAR. PRICE 6d.

"TORBAY PAINTS."

THE ORIGINAL,

As supplied during the present and many preceding years to the LONDON GASLIGHT & COKE COMPANY.

	Ground in Oil Paste. Per Cwt.	Mixed ready for use. Per Cwt.
"Torbay Red Oxide" - -	22s.	26s.
"Torbay Chocolate Oxide" -	22s.	26s.
"Torbay Gas Stone Colour"	27s.	30s.

Carriage Paid to any Railway Station in England or Wales.

TORBAY & DART PAINT Co., Ld.,
DARTMOUTH, DEVON.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advt. p. III., centre of JOURNAL.

Lanemark Coal Co.,
LIMITED.

LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,
NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

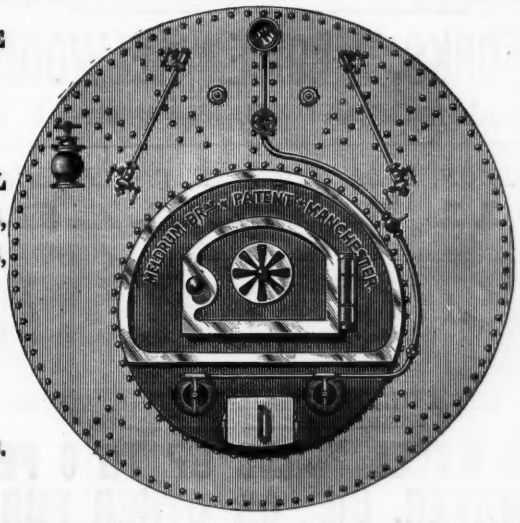
The following Town Water-Works Supplies have been obtained by this System, viz. :—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.

LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 125, BUNHILL ROW, LONDON, E.C.

DUST-FUEL FURNACE
(MELDRUM'S PATENT).

BURNS ANY KIND OF WASTE FUEL TO ADVANTAGE.

SUPPLIED to the PRINCIPAL GAS-WORKS, WATER-WORKS, ELECTRIC LIGHT STATIONS, &c., &c.



1500 WORKING.

LONDON OFFICE:
16, UNION COURT,
OLD BROAD STREET, E.C.
WILLIAM BOBY, Agent.

MELDRUM BROS., ATLANTIC WORKS, 13, CITY ROAD, **MANCHESTER.**

Telegrams: "MELDRUM MANCHESTER." National Telephone No. 1674.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

EDWARD COCKEY & SONS, LIMITED,

ENGINEERS & CONTRACTORS FOR GAS-WORKS.

TELEGRAPHIC ADDRESS: "COCKEYS FROME."

THE IRON-WORKS, FROME.

Messrs. COCKEY desire to draw the attention of Gas Engineers and Managers to their new form of GAS WASHER, which, by a recent patent, converts their HORIZONTAL Washer into one of a VERTICAL form.

The principle is the same as in the horizontal one, which has now been before the profession for a number of years, and where adopted is giving unqualified satisfaction.

The Washer is entirely automatic in its action, and does not therefore need any motive power—an advantage which will be apparent to all.

It is made in all sizes, from 25,000 TO 3,000,000 FEET PER DAY; and Messrs. COCKEY invite inquiries, which shall have early attention.

March, 1891.

PRICES ON APPLICATION TO THE SOLE MAKERS.

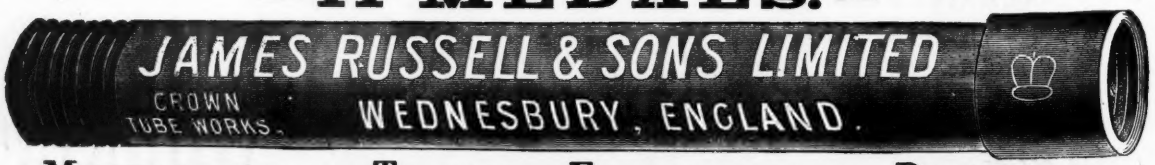
MAKERS OF FISH AND SMITH'S PATENT (NO. 5108) OVERFLOWS FOR REGULATING THE SEAL IN GAS-WASHERS, &c.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

London Office: 49, Fann Street, E.C.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—



MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street.

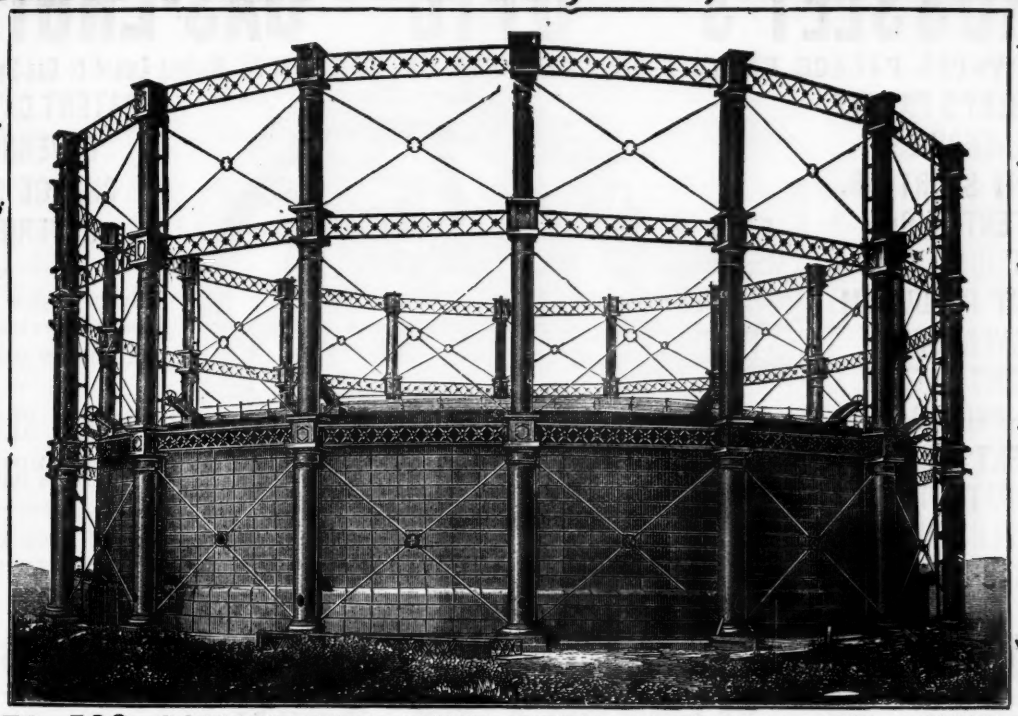
BIRMINGHAM: 114, Colmore Row.

LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, FOUL MAINS, RETORT LIDS, & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

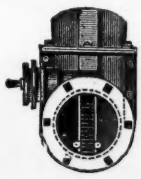
Near BARNSLEY, SOUTH YORKSHIRE.

NEWTON, CHAMBERS, & CO., LIMITED,

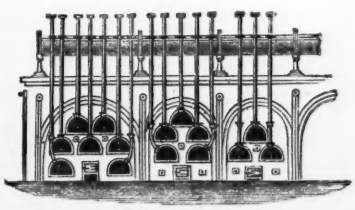
THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

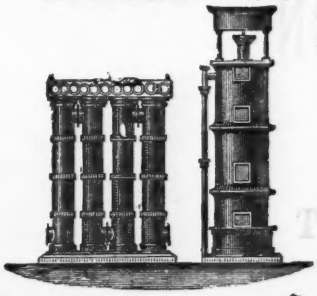
SLIDE VALVES,
WITH RACK & PINION
OR
Internal or External
SCREWS, of all Sizes.
GASHOLDERS,
AND
Gasholder Tanks.



CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description.
Iron Roofs, Columns, Girders, Floor Plates
and Tools, &c.

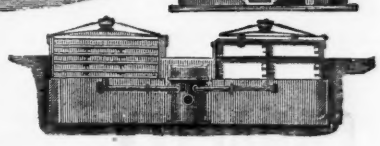


WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.



PATENT
CENTRE-VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

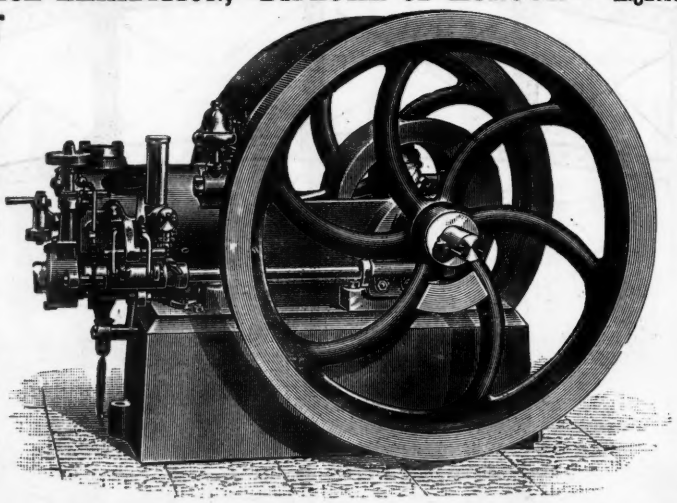
Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

CRYSTAL PALACE EXHIBITION, "DIPLOMA OF HONOUR"—Highest Award to Gas-Engines.

CROSSLEY'S PATENT OIL-ENGINES, PATENT STARTERS, PATENT TUBES FOR IGNITION, PATENT PENDULUM GOVERNORS, PATENT SAFETY HANDLES, PATENT TIMERS, PATENT ANTI-FLUCTUATING GAS-BAGS.



PATENT CATARACT GOVERNORS, CHANGE SPEED GOVERNORS.

Every Engine thoroughly tested before being sent out.

ALL PARTS MADE STRICTLY TO GAUGE.

GREAT REDUCTION IN PRICES.

OVER 800 ENGINES ALWAYS IN HAND.

CROSSLEY'S NEW HIGH-SPEED ENGINE FOR DIRECT ELECTRIC LIGHTING.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

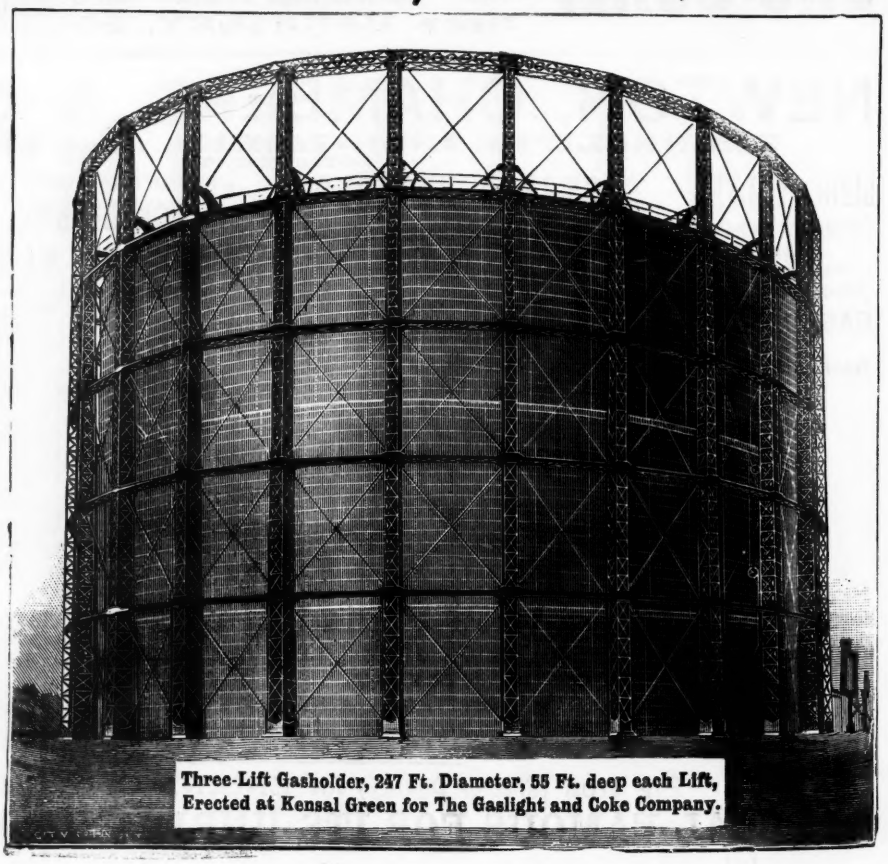
SAML. CUTLER & SONS, MILLWALL, LONDON.

NEARLY

8 MILLION

CUBIC FEET

CAPACITY.



Three-Lift Gasholder, 247 Ft. Diameter, 55 Ft. deep each Lift, Erected at Kensal Green for The Gaslight and Coke Company.

SEND FOR PRICE LISTS

OF

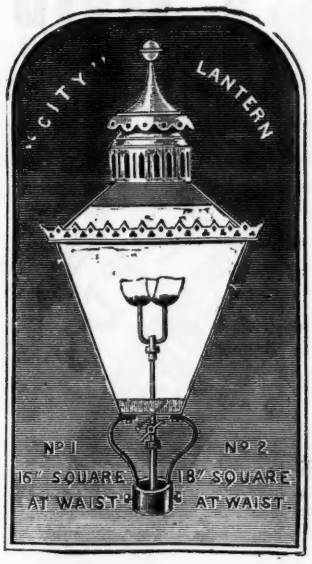
BRAY'S

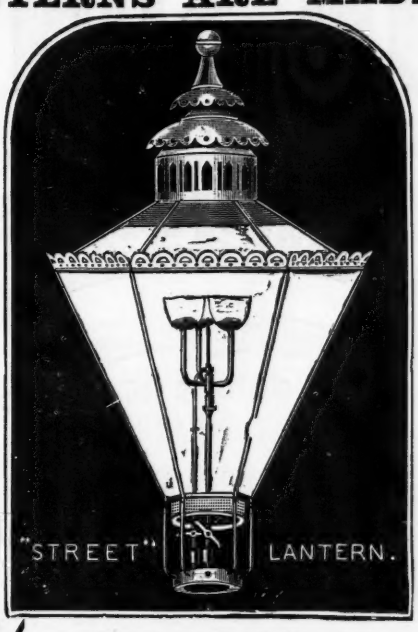
PATENT FLAT-FLAME LANTERNS.

From 30 to 1100 Candle Power.

They are suitable for Gas of every Candle Power.

ALL OUR LANTERNS ARE MADE OF COPPER.



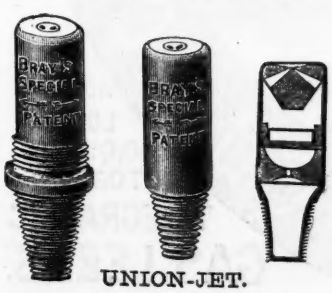


BRAY'S "SPECIAL" BURNERS

Are the best in the Market for general use, and are very moderate in price.

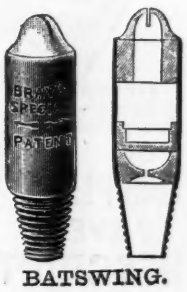
It is not unusual to see the ordinary Burner yielding less than half the light that Bray's "SPECIAL" would yield with the same consumption of Gas.

Gas Managers should try them on consumers' fittings; and they would see at once how to compete more effectively with the Electric Light.



UNION-JET.

SLIT-UNION.



BATSWING.

GEO. BRAY & CO., GAS LIGHTING ENGINEERS, LEEDS.

HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.
ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.
MAINTAINS A HIGH STANDARD IN RESIDUALS.

THE GRASSMOOR Co., Ld., CHESTERFIELD.

CLAYTON SON & Co. LTD

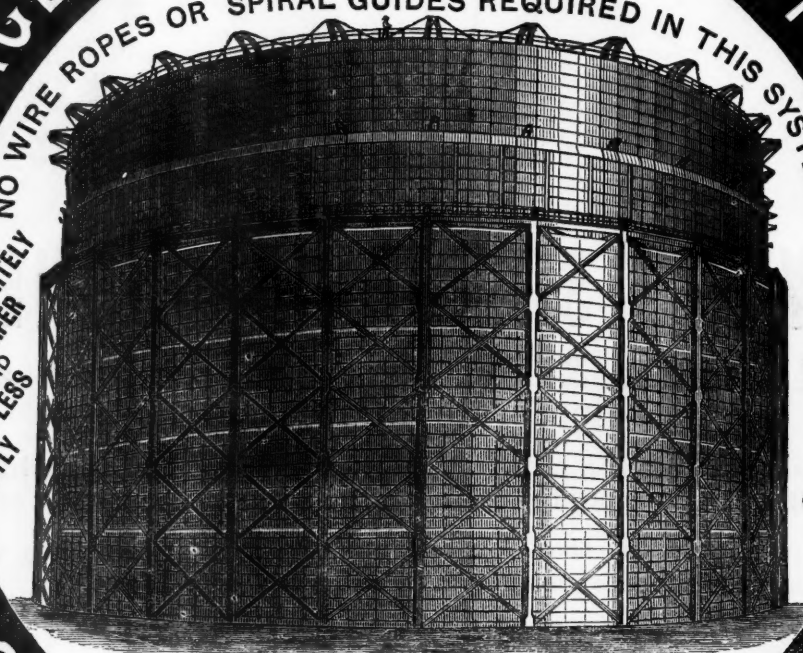
MAKERS OF

WORKS LEEDS

THE LARGEST GASHOLDER IN THE WORLD.

GASHOLDERS OUR SPECIALITY

NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.



INFINITELY SAFER AND FAR LESS COSTLY THAN ROPES OR SPIRAL GUIDES.

CAPACITY 12 MILLION CUBIC FT.

ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company
IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR.

MAKERS OF GAS PLANT OF EVERY DESCRIPTION

ROOFS PURIFIERS &c. ALSO

ADDRESS LONDON 60, QUEEN VICTORIA ST.

TELEGRAPHIC "GAS, LEEDS."

GASHOLDERS OF ANY SIZE

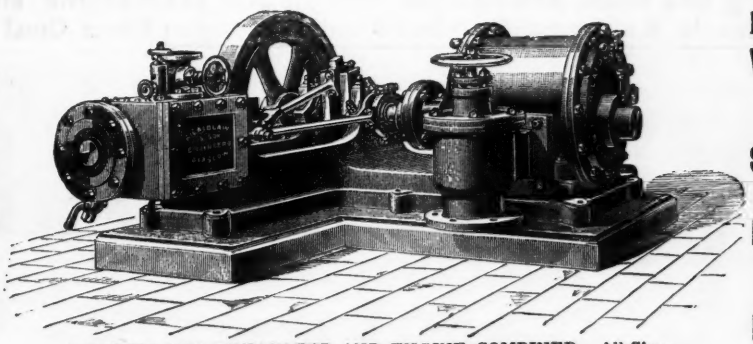
ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

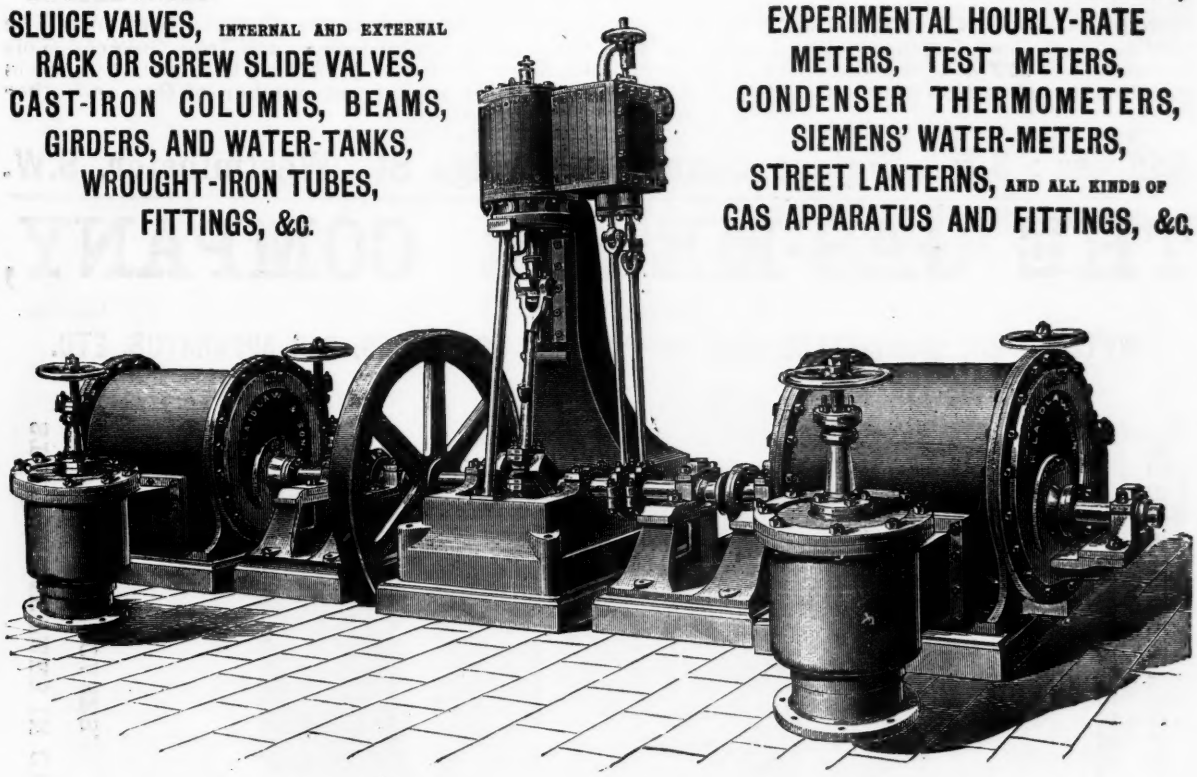
Manufacturers of **GAS APPARATUS** of every Description.

Makers in Glasgow of
CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING-ENGINES For Water-Works.
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES, INTERNAL AND EXTERNAL
RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS, BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.

Makers in Edinburgh of
WET AND DRY GAS-METERS, IMPROVED
STATION GOVERNORS,
PRESSURE REGISTERS (To Indicate Now Time),
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS, TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS, AND ALL KINDS OF
GAS APPARATUS AND FITTINGS, &c.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,
INTERNATIONAL EXHIBITION, EDINBURGH 1886.

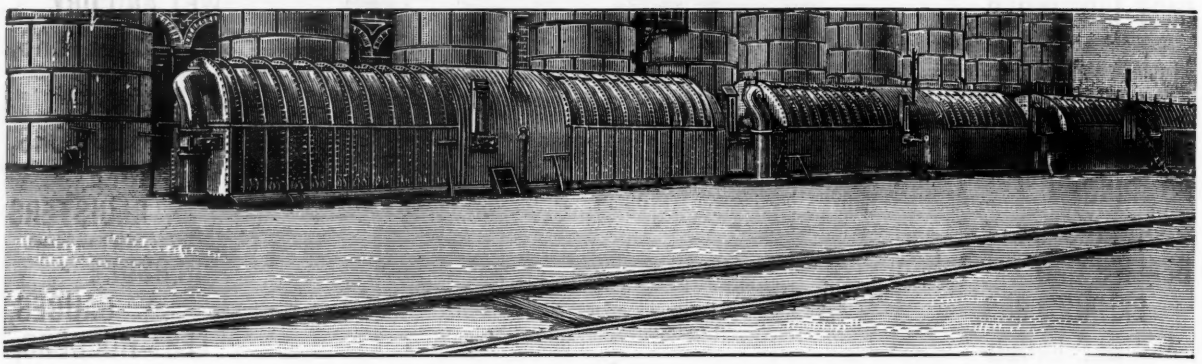
ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

KIRKHAM, HULETT, & CHANDLER, LD.,

Patentees of the

PATENT "STANDARD" WASHER-SCRUBBER.

☞ **467** of these Machines (capable of dealing with **447,807,000** cubic feet of Gas daily) have been supplied, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Beckton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company has **27** of these Machines in use, and Two more, each for 3½ million feet per day, are in course of construction for them. They are also in operation at a great number of Gas and other Works in this Country and abroad.

Address : 3 & 4, Palace Chambers, Bridge St., Westminster, S.W.

THE GAS-METER COMPANY,

MANUFACTURERS OF LIMITED.

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.

STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM, LATE WEST & GREGSON, Established 1830.

For Prices and Particulars apply to

R. L. ANDREWS, General Manager.

Works: 238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Address: "METER."

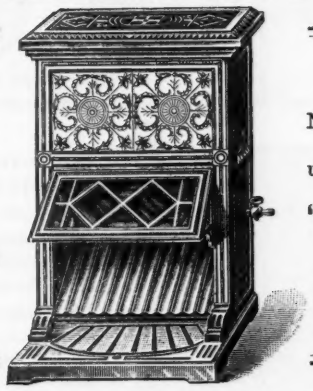
(See Advertisement on back of Wrapper.

TELEGRAPHIC ADDRESS:
"ROBUSTNESS, LONDON."

GAS & WATER
WORK
J. & H. ROBUS,
ENGINEERS & CONTRACTORS,
20, BUCKLERSBURY, LONDON, E.C.,
furnish Plans, Estimates, and Specifications for SINKING BOREHOLES *and* WELLS; *Erecting* RESERVOIRS, FILTER-BEDS, *and* GASHOLDER TANKS; *and* EVERY REQUISITE *for* GAS *and* WATER WORKS,
INCLUDING
MAIN LAYING
EXCHANGE TELEPHONE 1756.

L. W. LEEDS' PATENT
FLOOR-WARMING GAS-STOVES.

BEWARE OF IMITATIONS.



None Genuine unless branded "L. W. LEEDS PATENTS."

HERSEY BROS., LTD., 70, Berners St., LONDON, W.
(LONDON OFFICE OF L. W. LEEDS.)

JOHN BROTHERTON, Limited,
IMPERIAL TUBE WORKS,
WOLVERHAMPTON.

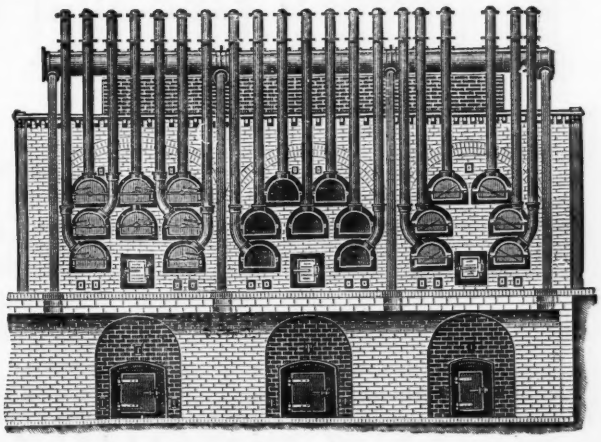
MANUFACTURERS OF
WROUGHT-IRON TUBES AND FITTINGS FOR GAS, WATER, STEAM, AND ALL OTHER PURPOSES.
Also of IRON and STEEL CYLINEDRS for the conveyance of COMPRESSED GAS.
PRICES ON APPLICATION.

JONAS DRAKE & SON,

TELEGRAPHIC ADDRESSES:
"DRAKESON, HALIFAX."
"ECLAIRAGE, LONDON"

GAS ENGINEERS,
CONTRACTORS,
IRONFOUNDERS,

BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.



TELEPHONE No. 43.
HALIFAX EXCHANGE.

RETORT SETTERS,
FURNACE BUILDERS
ETC., ETC.

REGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S, VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

INCLINED RETORTS

GASEOUS FIRING A SPECIALTY.
RETORT SETTING IN ALL ITS PRINCIPLES AND BRANCHES. BENCHES FITTED UP COMPLETE.
DRAWINGS, SPECIFICATIONS, AND ALL OTHER PARTICULARS ON APPLICATION.

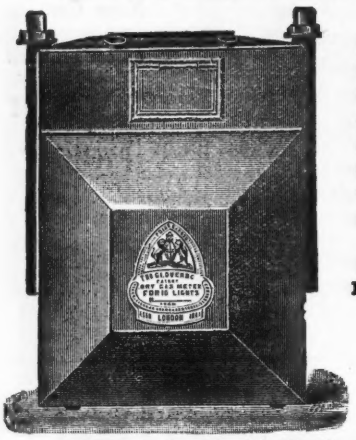
LONDON OFFICE:
60, QUEEN VICTORIA ST., E.C.

OVENDEN, HALIFAX.

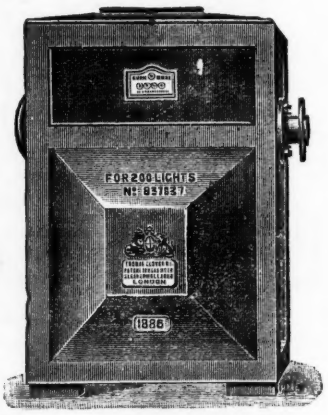
[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;
The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.
Are upheld for five years without charge.



Telegraphic Address: "GOTHIC LONDON."
Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

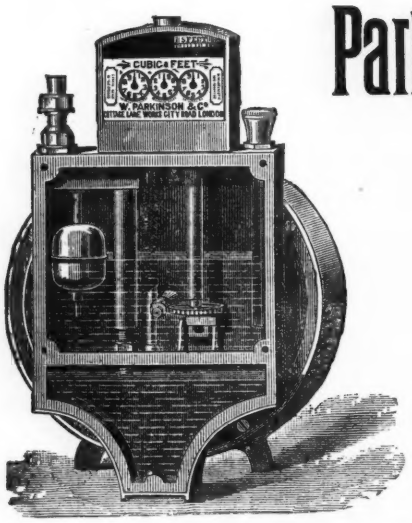
214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL:	BIRMINGHAM:	LEEDS:	MANCHESTER:
62, VICTORIA STREET.	3, BRIDGE ROW, DERITEND.	BOAR LANE CHAMBERS, 4, BASINGHALL STREET.	37, BLACKFRIARS STREET.
Telegraphic Address: "GOTHIC."	*Telegraphic Address*: "GOTHIC."	*Telegraphic Address*: "GOTHIC."	*Telegraphic Address*: "GOTHIC."

W. PARKINSON & CO.,

MANUFACTURERS OF WET & DRY METERS.

OLDEST ESTABLISHED FIRM IN THE TRADE.



Parkinson's Cast-Iron Case Meter.

Works with very little friction.
Will stand very high pressures.
Cannot possibly be shut off by sudden increase of pressure; the float being affected by outlet gas only.
Allows for loss of water by evaporation without materially affecting the registration or shutting off the gas.
Unexcelled for Simplicity of Construction, Excellence of Workmanship, and Accuracy of Registration.

COMPENSATING METERS,

In Tinned or Cast-Iron Cases.

COTTAGE LANE WORKS, CITY ROAD,	BELL BARN ROAD WORKS,	10, MAWSON'S CHAMBERS, DEANSGATE,
LONDON.	**BIRMINGHAM.**	**MANCHESTER.**
Telegraphic Address: "INDEX."	Telegraphic Address: "GAS-METERS."	Telegraphic Address: "PRECISION."

CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

The Board of Trade and the Railway Commission . . . 1119
The Result of a Leak of Gas at Hastings . . . 1120
The Standard Candle Standardized . . . 1120
The Trade Councils Bill . . . 1121

WATER AND SANITARY AFFAIRS—

The Meetings of the Southwark and Vauxhall and Grand Junction Water Companies—Schemes for Additional Reservoirs . . . 1121

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market . . . 1122
Electric Lighting Memoranda . . . 1122
The Labour Question in France . . . 1123
Statutory Powers and the Common Law . . . 1124

NOTES:—

A Guide for Gas Consumers . . . 1125
Smoke-Washing for Profit . . . 1125
The Effective Duty of Oil and other Fuels . . . 1125
A Modification of the Platinum Standard of Light . . . 1125

TECHNICAL RECORD:—

The Removal of Tar from Gas . . . 1125
The Granger Steam-Jet Nozzle . . . 1126
Persian Coal . . . 1127

REGISTER OF PATENTS:—

Coin Operated Devise for Gas Meters—Glover, S. and T., and Critchley, J. 1127
Valves for Hydraulic Mains, Washers, &c.—Cripps, F. S. . . . 1128
Water-Meters—Mills, B. J. B. (Rostagnat, H.) . . . 1128
Gas-Engines—Dawson, H. T. . . . 1129
Gas-Generators connected with Steam Boilers—Bemelmans, L. . . . 1129
Gas-Engines—Dixon, C. W. . . . 1129
Patent Notices . . . 1129

CORRESPONDENCE:—

Dr. Thorne and the Peebles Oil-Gas Process . . . 1130
Mr. Alex. M'I. Cleland and The Gas Institute Index . . . 1131
The Meaning of "Stove" . . . 1131
An "Improved" Invariable-Water-Line Gas-Meter . . . 1131
The Use of Angus Smith's Solution for Water-Pipes . . . 1131

LEGAL INTELLIGENCE:—

High Court of Justice—Queen's Bench Division—
In the Matter of the Lighting and Paving Board of Eckington . . . 1131
Jenkins *v.* Hastings and St. Leonards Gas Company . . . 1131

MISCELLANEOUS:—

Metropolis Gas Supply—The Referees' Notification as to the Candles to be Used in Testing Gas . . . 1133
Meeting of the Continental Union Gas Company . . . 1134
Meeting of the Southwark and Vauxhall Water Company . . . 1135
Meeting of the Grand Junction Water Company . . . 1136
Meeting of the Johannesburg Water-Works, Estate, and Exploration Company, Limited . . . 1137
The Proposed Gas-Works for Blackburn—Criticism of the Scheme . . . 1138
Wigan Corporation Gas Supply—The Cost of Gas Production; Strictures on the Accounts . . . 1138
Gas Affairs at Sowerby Bridge—Local Government Board Inquiry; A Complaint as to a Nuisance at the Works . . . 1138
The Cost of the Bristol Electric Lighting Installation—Mr. Preece's Estimates Largely Exceeded . . . 1139
New Water-Works for St. Helens—Local Goverment Board Inquiry . . . 1139
Notes from Scotland . . . 1140
Current Sales of Gas Products . . . 1141
Coal Trade Reports . . . 1141
Gas and Water Companies' Stock and Share List . . . 1142

PARAGRAPHS.—The New Issue of the East London Water Company's Debenture Stock, 1121—Lectures by Professor Lewes on the Chemical Technology of Coal Gas, 1121—Mr. W. S. M'Gregor, 1122—The Donkin Family and the Establishment of the Institution of Civil Engineers, 1122—The Secretaryship of the Crystal Palace District Gas Company, 1123—The Management of the Metropolitan Gas Companies, 1124—The Salford Corporation and the Hunter Compact, 1124—Paint as a Preservative of Iron Structures, 1127—Patents in the United States, 1127—The Oldham Electric Light Works, 1129—Electric Lighting for Wolverhampton, 1129—The Chairman of the Bradford Corporation Gas Committee and Oxy-Oil Gas, 1129—Toronto Consumers' Gas Company, 1137—Extension of Scrubbing Plant at Beckton, 1138—A New Gasholder for Nelson, 1138—Ashbin Refuse and Electric Lighting, 1140—The Cost of the Coal Strike at Widnes, 1141—Increases in the Price of Gas, 1141—The Sheffield Corporation and Compensation Water, 1141—Sales of Shares, 1141—New Water-Works for East Cowes, 1142—The Supplementary Supply of Water for Leicester, 1142—Electric Lighting of Chatsworth House, 1142—The Electric Lighting of Chelmsford, 1142—Electric Lighting for Walsall, 1142—The Electric Lighting Scheme for Stafford, 1142—The Price of Gas at Lytham, 1142—Patent Gas Producer Syndicate, Limited, 1142—Messrs. R. and J. Dempster, Limited, 1142—Dover as an Oil Port, 1142—Kingsbury Water Scheme, 1142—Dublin Water Supply, 1142—The Gouthwaite Reservoir of the Bradford Corporation, 1142—A Mishap to a Gasholder at Raunds, 1143—Mr. Southern on the Working of the Manchester Gas Undertaking, 1143—The Utilization of Town Refuse for Electric Lighting at Harrogate, 1143—Stealing Gas at Sheffield, 1143—The Proposed Board of Conciliation for the Coal Trade, 1143.

CHRISTMAS HOLIDAYS.

Owing to the Christmas Holidays, it will be necessary to go to press earlier than usual with the next number of the JOURNAL. We shall therefore be obliged by correspondents forwarding communications intended for that issue so as to reach us not later than FRIDAY, the 22nd inst.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 19, 1893.

The Board of Trade and the Railway Commission.

THE Select Committee of the House of Commons on Railway Rates and Charges, of which Mr. Shaw Lefevre is Chairman, have agreed upon their report. The Committee were appointed to inquire into the manner in which the Railway Companies have exercised the powers conferred upon them by the legislation of 1891 and 1892, and also into the method by which disputes between the Companies and the public in the matter of goods rates are settled. With regard to the action of the Railway Companies in levying the maximum rates permitted to them under the altered regulations, the Committee declare that they feel it difficult to understand fully the explanations afforded by the Companies, and still more difficult to justify what they do understand of them. They consider that the course taken by the Railway Companies was unsatisfactory and unjustifiable; and they remark that they are not surprised that there should be strong feeling and a sense of insecurity among traders and others, nor do they wonder that the intervention of some tribunal to fix actual rates should be strongly demanded. The Committee are of opinion that the margin between the old actual rates and the present parliamentary maxima was not granted by Parliament in order that immediate advantage should be taken of it. It was, they consider, intended to meet certain contingencies of rise in prices and in wages, which certainly had not occurred when the Companies began to put up the rates. This is the position we always took in regard to this matter; believing the maximum rates allowed to the Companies were only meant to act as the maximum prices of gas permitted to gas manufacturers—as a safeguard against the consequences of bad times. Unhappily, the Railway Companies failed to justify this confidence; and they have only themselves to thank if their rapacity has resulted in raising the country against them. This may appear to be strong language; but the fact that some of the best-managed railway lines were quick to see their mistake, and that they receded from the false position into which they had been led, is ample justification for stigmatizing the whole railway policy in this regard as almost more than a blunder. Some of the worst railway administrations in the kingdom persist, however, in snatching at the extra profits allowed them by a deceived Legislature; and an interesting portion of the Committee's report refers to the means whereby the recalcitrant Companies may be brought to hear reason.

It is admitted that the Board of Trade does not constitute a satisfactory tribunal for the exercise of functions of an essentially judicial nature; and so the Committee fall back upon that much-abused institution, the Railway Commission. The Committee confess that they have received complaints as to the Commission; and those readers of the JOURNAL who are familiar with the objections that have been raised to the constitution of the London Gas Referees will be specially interested in hearing that it has been complained of the Commission that there is nobody on it who is "specially acquainted with the "interests and requirements of traders." The Commission was appointed under an Act passed in 1873, which directed that it was to consist of three members, of whom one was to be "of experience on railways," and another a member of the legal profession. The first Chairman of the Commission was Sir Frederick Peel; and the member selected for special knowledge with regard to railways was the late Mr. Price, who had also great experience in commercial affairs, and supplied this element to the Commission. Under a subsequent Act, a Judge of the High Court of Justice was appointed to act *ex officio* as President of the Commission; and the two lay members of the Commission were reappointed. On the death of Mr. Price, his place was taken by Lord Cobham, with the result that, as now constituted, "the Commission has "on it no member who has had any experience in com-"mercial affairs, and who is specially acquainted with "the requirements of traders." Partly, as it seems to be felt, in consequence of this alteration in the constitution of the Board, its members have dropped into what has practically proved a sinecure. The trading community has left the Commission severely alone; and its members have been drawing their comfortable £3000 a year for an average of 23 days' work per annum. The trail of a bureaucracy is over it, and has killed it. The Committee declare that they would not feel justified in recommending the continuance of the Commission in its present form. They think that one of the members should be experienced in trade; and that when opportunity occurs, this requirement should be fulfilled. They also suggest that the appointments of the lay Commissioners should not be permanent; believing that fresh experience, whether of railways or of trade, would from time to time be desirable. They accordingly recommend that appointments should not be for a longer period than ten years. Upon the subject of the costliness of proceedings before the Commission, this is stated to be mainly due to the high fees of the eminent lawyers employed by the Companies. To

check the undue penalizing of appellants under these conditions, the Committee suggest that, in proceedings before the Commission, other than disputes between two or more Companies, the Commission should not have power to award costs on either side, unless it should be of opinion that either the claim or the defence has been frivolous and vexatious. This report is evidently of a nature to stir the dry bones of the magnates of red tape at whom its conclusions are aimed.

The Result of a Leak of Gas at Hastings.

THE case of *Jenkins v. The Hastings and St. Leonards Gas Company*, the conclusion of which will be found reported in another column, is chiefly noteworthy as an instance of the risk run by gas undertakings in fulfilling their obligations to the public. It was an action brought by one of the Company's consumers—an owner of timber works at St. Leonards—for damages done to his premises by a fire, due, as was alleged, to the carelessness of the Company's servants. The facts in the case were of the plainest and most ordinary character; and any interest they possess for others than the parties implicated in the affair must be set down to this very commonplace nature of the incident, regarded as an experience in gas supply. The service-pipe through which the premises were supplied was found to be partially choked, as is frequently the case with service-pipes; and upon complaint being forwarded to the Company, it was attended to in the ordinary course—a fitter and his mate belonging to the outdoor staff being sent to do what was necessary. These men disconnected the pipe from the meter on the inlet side, and slacked off the union on the other side in order to permit of the meter being turned out of the way. Then, finding evidence of an obstruction in the pipe, they blew it out, and connected up the meter again; leaving, as was supposed, everything sound and safe as before. Something was said at the trial about the work being hurriedly done on account of the hour, which was after knocking-off time on a Saturday afternoon; and it was also mentioned that the Company's men borrowed a box of matches from one of the consumer's men, in order to test the soundness of the gas joints, which was done in the usual way by a flame. No leak being noticed, all hands left the premises; and a short time afterwards a man living in the neighbourhood observed that a fire had broken out. The evidence given on this head was particularly clear; and it was not shaken by cross-examination. Upon seeing smoke issuing from the building, a witness entered, and actually saw a flame arising from the meter, and burning through the floor above. The outlet-pipe was melted away, and the gas burning as it came from it. This statement was fully corroborated by a second eye-witness. It might well have been thought that this testimony was enough, unless the Company had been in a position to demonstrate bad faith, or some other sufficient cause, for discrediting the witnesses. This they did not attempt, but went into Court with a plea which amounted to nothing more than a declaration that their servants had not been careless; and that if such a leak as might possibly have been left in the region of the meter union unnoticed by them had in fact been ignited by the match used to test the soundness of the joint, it could not have melted the "compo." pipe connection, and so caused the resultant fire. The Company's case completely broke down, however; and they are consequently left to pay the damages as determined by reference. We are not in the confidence of the Company, to be able to say why they decided to fight such a case; but it is impossible to see, on the evidence, how a verdict in their favour could have been expected. It would be superfluous to comment upon the way in which the question at issue was fought; and the wisest course for the Company to adopt will now be to pay the bill with a good grace, and say no more about it.

The accident is just one of those deplorable mishaps which may overtake any person or corporation, and which cannot be rendered impossible so long as men continue to be human, and therefore fallible. If a fatal result to any person had supervened in this case, and the matter had come before a Coroner's jury of average intelligence, in all probability a "rider" would have been appended to the verdict, to the effect that "a naked light "should not be employed to test the soundness of joints "in gas-pipes." Such a recommendation has, indeed, been put upon record, and is a specimen of the beautifully obvious reflections that are likely to occur to unpractical observers of similar occurrences. It is not easy to see, however, what other equally ready and simple test is open to the gasfitter; and of the tens of thousands of such tests that are made every day throughout the country, only an infinitesimal proportion ever go wrong. Nevertheless, a handy means of rendering a tiny blue gas-flame more visible in daylight would be useful on occasion; although every purpose would be served if fitters could be depended upon to hold their hand in contact with all joints for a second or two after testing with a flame.

The Standard Candle Standardized.

THE important "Notification" of the London Gas Referees as to the candles to be used in testing gas, to which reference was made last week, and the text of which will be found in another column, is the opening up of a fresh chapter in the history of practical and statutory gas photometry. It is very remarkable that, after such a long employment for this purpose of candles vaguely described as "sperm candles of six to the pound, each burning 120 "grains per hour," it should have been found necessary to formulate precise instructions as to the composition and method of manufacture of such candles; but the incident is illustrative of a very numerous order of puzzles which from time to time arise in connection with the interpretation of common words when used in a narrow statutory sense. To quote an old riddle, it may be said that a good deal of judicial time and perspicacity is constantly being exercised in finding an answer to the question: "When is a door not a door?" In the instance in point, the glory of posing the analogous question of "When is a candle not a candle?" must be ascribed to the London County Council. Some months ago the officials of the gas-testing department of the County Council spread consternation among the London Gas Companies by supplying to the testing-stations candles of a different make to those which both parties to the operation of gas testing had been in the habit of using. These candles, although unexceptionable in point of description, gave more light than the others; and consequently depreciated the illuminating value of the gas tried against them. A "bad return" of certain tests conducted with the strange candles was made to the Chief Gas Examiner (Dr. A. W. Williamson, F.R.S.), who, on being apprised of the circumstances, disallowed it; and a deadlock resulted, which was only solved by the Referees consenting to do what they had never been called upon to do before—that is, to "prescribe" the candles. It is open to the friends of the parliamentary standard candle, if there are any left in the land, to argue that if this matter had been attended to earlier, these much-abused articles would not have fallen into disrepute. It is even possible to imagine that the present Standards of Light Committee might not have been found necessary, or at least might have been spared considerable labour, if it had been better understood beforehand what a parliamentary standard candle really is. The Referees have now made it plain that whatever else the standard candle may be, it is not, strictly speaking, a candle made wholly of sperm. It is still to be called a sperm candle; but a proportion of beeswax is to be added to it, with the object of remedying brittleness, and aiding in the formation of a good cup in burning. The preparation of the wicks is also duly attended to by the Referees, who have undertaken to examine them. Indeed, the whole of the "Notification" is an eloquent testimony to the importance of minute details in connection with the manufacture of candles intended to burn with the utmost attainable regularity, and furnish a uniform intensity of light. The points of the Referees, prescription could only be criticized by an expert candle maker; and they contain many internal evidences of having been settled with reference to the best practices of the trade. There is only one thing in connection with the manufacture and use of candles that occurs to us at present as an omission from the "Notification," and deserving of some inquiry. It is the absence of any mention of the age of the candles when used. It may be concluded from this that the age of a candle does not matter, in the opinion of the Referees, having regard to the ordinary conditions of the trade. The point has been raised in some discussions of the subject; but it must now be considered as immaterial. In view of the pains taken by the Referees in the preparation of their candle-making prescription, it is hardly too much to say that they have

done their best to give the candle standard a renewed lease of life. If the standard should still be found unsatisfactory, on the other hand, the process of disestablishing it should be facilitated by such a fresh proof of the essential unreliability of candles, albeit made with all possible care.

The Trade Councils Bill.

A BILL for the establishment of Trade Councils has been introduced by Mr. Bousfield and others, which is noteworthy as a further indication that active interest in Labour questions is by no means confined to Progressive "Labour" members of Parliament. According to this measure, which is devoid of preamble, a Trade Society may be formed for any trade, consisting of employers and workmen, with district councils, provincial councils, and a grand council. The district council is to be composed of equal numbers of employers' representatives and workmen's representatives, with an odd man added. The provincial councils are to comprise a group of districts, and be composed of representatives elected by the district councils. A grand council for the trade is to be composed, for ordinary purposes, of representatives elected by the provincial councils, in the proportion of one to every two thousand members. In any district, membership of a council is to be voluntary until five-sixths of the total number of both classes in the district are enrolled, after which membership is to become compulsory. For special purposes, the grand council of a trade is to be specially constituted by the addition of delegates from workmen's and employers' unions in a stated proportion; and the grand council when so constituted is to have power to make bye-laws in relation to the settlement of trade disputes, the regulation of the hours of labour of persons employed in manual labour in the trade, the regulation of the admission of apprentices, the formation of an employment register, and "such other matters as they may be from time to time "authorized to deal with by order of the Board of Trade." For another set of particular purposes the grand council is to be specially formed by the addition of delegates from friendly and benefit societies, when it is to have power to deal with such matters as sick and accident relief and compensation; and likewise old-age pensions. A proposal is mooted for dealing with the last named in conjunction with the Guardians of the Poor. A variety of other matters are provisionally dealt with by the Bill, which deserves appreciative study as at least a well-meant contribution towards the solution of one of the gravest difficulties of the age. It is impossible to take such a project of legislation seriously as it stands, not only because to talk of any Bill in the present Parliament is waste of time, but also because of the absence of any indication that the particular scheme is regarded with favour by a considerable section of the industrial population. The species of qualified "local option" included in the Bill is to be noticed in connection with the recent proceedings on the Employers' Liability Bill. If such a scheme had appeared in regard to the regulation of the liquor traffic, the practical politicians of the day would look at it in a different light from that in which the noisy minority of Trade Unionists permit their allies to contemplate a question between employers and employed.

The New Issue of the East London Water Company's Debenture Stock.—The tenders for the £35,000 of new perpetual 4½ per cent. debenture stock of the East London Water Company, for which the Directors invited applications in our advertisement columns a few weeks ago, were opened last Thursday; and the stock realized £143 6s. 7d. per cent. It was tendered for nearly ten times over.

Lectures by Professor Lewes on the Chemical Technology of Coal Gas.—The lectures to be delivered in connection with the Borough of West Ham Technical Classes next term will include a course of seven on "The Chemical Technology of Coal Gas," by Professor Vivian B. Lewes, F.I.C., F.C.S., Chief Gas Examiner to the Corporation of London, to be delivered in the Town Hall on successive Tuesday evenings, commencing on the 23rd prox. The first lecture will, of course, deal with the formation of coal gas; and the second, with its composition. In the third lecture, the subject of destructive distillation will be discussed; and in the remainder, Professor Lewes will discourse on the purification, enrichment, consumption, and testing of coal gas. This series of lectures cannot fail to be highly instructive to those who attend them; and the Corporation of West Ham are to be congratulated on having secured the services of one who is competent to deal with this important branch of technical education in an attractive manner.

WATER AND SANITARY AFFAIRS.

A MATTER of especial importance, in relation to the water supply of the Metropolis, presents itself in the speech of Mr. Francis Tagart, in presiding over the half-yearly meeting of the Grand Junction Company last Wednesday, as given in another part of the JOURNAL. In the report of the Royal Commissioners, prominence is given to the subject of storeage reservoirs in the Thames Valley; and, among the plans proposed for this purpose, preference is expressed for the scheme devised by Mr. Walter Hunter, M.Inst.C.E., a Director of the Grand Junction Company, and Mr. Alexander Fraser, M.Inst.C.E., the Company's Engineer. The plan consists in the construction of nine reservoirs upon land in the neighbourhood of Staines, at a distance of only a few miles from the various works appertaining to the supply of water to London from the Thames. The intake would be about a mile above Staines; and these reservoirs would be constructed *seriatim* as required, so as to keep pace with the growth of the population, without entailing any unnecessary expense. The project was approved by the late Mr. Hawksley and Sir F. Bramwell; and the Commissioners say in their report: "Broadly "speaking, and without committing ourselves to details, "we may say that the conception of this Staines "scheme of storeage commends itself to us as the "best which has been suggested." They also go on to specify certain features in the scheme which constitute so many points in its favour. It is obvious that the Commissioners had this plan in view when, among their "Conclusions" at the close of the report, they said: "We are of opinion that, by the construction of storeage "reservoirs in the Thames Valley, at no great distance "above the intakes of the Companies, it will be possible to "obtain an average daily supply of 300 millions of gallons "without taking in any objectionable part of the flood "water." It was also remarked that this could be done in such a way as to secure that the volume of water left in the river on the rare occasions of exceptional drought "would be substantially greater than it is under existing "conditions." Such were the results distinctly promised by Messrs. Hunter and Fraser; and when it is borne in mind that the prospect of drawing 300 million gallons per day from the Thames is essential to the estimate which the Commissioners have formed for the future supply to the Metropolis, it will be seen how needful it is that something should be done to carry out such a project as that which has been so approved. But as the case now stands, it is imposible to shut out from view the plan embodied in the Bill to be brought into Parliament next year by the Southwark and Vauxhall Company, and on which we offered some remarks in our issue for the 28th ult. Of the supply at present taken from the River Thames, for the use of London, fully one-fourth is absorbed by that Company. Hence they are forward with their plan for the construction of a storeage reservoir having a capacity of 270 million gallons, to be situated in the neighbourhood of Sunbury and Hampton. Alderman Sir H. E. Knight, the Chairman of the Southwark and Vauxhall Company, at the half-yearly meeting of the shareholders last Tuesday, stated that the Directors fully concurred in the recommendations of the Royal Commissioners as to storeage reservoirs. The Company were constructing one already; and their Bill in the coming session was to provide for the complete fulfilment of the requirements laid down in the Commissioners' report.

With these facts before us, we proceed to consider more distinctly what is said on the subject by Mr. Tagart. His proposal with respect to storeage reservoirs is that the Grand Junction Company should act conjointly with the other Thames Companies, aided by their Engineers, Secretaries, and other officers, in the hope of settling some mode by which to carry out the scheme devised by Mr. Hunter and Mr. Fraser. It was understood, at the time this plan came before the Royal Commissioners, that it had the approval of all the Companies drawing from the Thames; and there can be no doubt that Mr. Tagart is justified in saying that, by preparing this plan, Messrs. Hunter and Fraser rendered invaluable service not only to the Grand Junction Company, but to all the London Water Companies. If the Commissioners had not seen a plan of this kind, they might have doubted whether the resources

at the disposal of the London Companies were really sufficient for the growing wants of the population. In that case, the whole question might have been precipitated; and the position of the Companies would have been very different from that which it has lately become. The Directors of the Grand Junction Company are wise in accepting it as their duty, and that of all the London Companies, to provide speedily for carrying out the recommendations of the Royal Commissioners. That it may not be supposed there is any indifference on this point, the Grand Junction Directors have lately communicated with the Local Government Board, stating that the Commissioners' report is receiving serious consideration at their hands, with a view to carry out a scheme of storeage. Mr. Tagart very properly cautions his own shareholders—and the advice will be of value to all the Companies—not to be so elated with the result of the recent inquiry as to suppose there is nothing left to be done. The report of the Commission does not justify inaction; but, if properly understood, it will encourage and stimulate the Companies in the fulfilment of their responsibilities. This counsel is judicious. The willingness of the Companies to take action is shown in the case of the Southwark and Vauxhall Company. Whether the plan propounded by the latter should be merged in the larger scheme of the nine reservoirs, is a question which perhaps calls for consideration, or the lesser scheme may be taken as an instalment of the larger one. Whatever may be said on this point, there can be no doubt that Mr. Hunter, while disavowing all personal considerations, was right in the expression of his conviction, at the Grand Junction meeting, that "the only "true policy of the Companies was to accept the report "of the Royal Commission loyally, and to carry it out." That report, with all its conclusions, is really a call to action; and it would be a fatal mistake to infer that the Companies may now simply "rest and be thankful." We do not think that any such mistake is likely to occur. Improvements are proceeding. The Grand Junction Company are now able to report that the constant supply covers the whole of their district; and at both the meetings last week, it was shown that the filtration of the supply, already so admirable in its results, was being diligently pursued. The Streatham well is being turned to good account; and there is the prospect of other wells being opened from time to time, so as to augment the supply in its most popular form, though the water from the river is purified to an extent which makes it an actual rival to the deep wells.

Mr. W. S. M'Gregor, of Leslie (N.B.), has been appointed Chief Gas Engineer to the Imperial Ottoman Government, and has left for Constantinople. Mr. M'Gregor has already been in Turkey, where he was engaged in the erection of gas-works; and we understand that he has been asked to take his old position on more favourable terms.

The Donkin Family and the Establishment of the Institution of Civil Engineers.—In the course of an obituary notice of Mr. Bryan Donkin, M.Inst.C.E., whose death we recorded last week, which appeared in the *Engineer* for the 8th inst., some interesting particulars are given as to the formation of the Institution of Civil Engineers, with which the father of the deceased was closely associated. About the year 1817, three young men—Messrs. H. R. Palmer, Harris, and James Ashwell—who were then pupils at the works of Mr. Bryan Donkin at Bermondsey, were desirous of forming a kind of club, to meet and discuss various matters connected with the engineering profession. Their first step was to communicate the scheme to their master, and to ask him how they should proceed to realize it. After discussing the project, Mr. Donkin gave it his approval; but he recommended them to apply to Mr. Telford, then the recognized head of the profession, for advice and assistance. Mr. Telford agreed as to the advisability of establishing a society for debating engineering questions, and for forming a bond of union between members of the profession. Assisted by Mr. Telford, Mr. Donkin, and others, the embryo association held its first meetings at Cannon Street, Westminster, when Mr. Donkin's then cashier was elected first Secretary *pro tem.* A few other members joined—viz., W. Maudslay, J. Field, J. Jones, and C. Collinge; and apparently a larger meeting was held in 1818 at the King's Head Tavern, Cheapside. The young society, however, did not increase much in numbers until, in the year 1820, Mr. Telford was requested to become first President. Both he and Mr. Donkin continued to show their interest in the undertaking; and, in 1828, Mr. Donkin exerted himself with others in helping to obtain the Charter for the new Institution, which there seems no reason to doubt originated in his own workshops. His son, recently deceased, distinctly remembered, when quite young, going to several of the earliest meetings.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1142.)

THE week just concluded has been a somewhat more favourable period in the Stock Markets than its predecessor, in this respect that there has not been any very considerable fall in prices. Some have suffered to an extent—to wit, the American; and that is an important factor now-a-days. On the other hand, however, things have been going better in the Foreign Market, where a few indications calculated to be more cheering have been perceptible. But taking them all round, the markets have been exceedingly quiet; and they may naturally be expected to remain so until after the Christmas holidays are over. The only things which have done really well are the choice investment stocks, the demand for which is unabated The settlement was satisfactorily adjusted; being, like similar recent operations, of light proportions. The Money Market profited by the requirements of the Stock Exchange, and was firm and steady; but, apart from this, there was not much demand outside. The Gas Market was very fairly active, all things considered, though business tailed off rather quiet towards the end of the week. Many changes in the quotations were effected, and movements were irregular. In Gaslights, the "A" suffered a relapse, and lost all the points it had gained in the last fortnight or so; but there was not much business done in it. The best prices was 231 on the opening day, from which it fell away to 227½—the closing mark. The secured issues, however, were brisk and firm; and the *ex div.* quotations of the debenture stocks came out higher. South Metropolitans were only moderately active; but all three issues rose in price. Commercials were very quiet; and their only feature is an advance in the debenture. The Suburban and Provincial undertakings were much neglected; and the only change is a fall in British. Of the Continentals, Imperial was weak, and lost 2; but Union was in good favour, and both issues had a considerable rise—the report and accounts presented at the general meeting last week being satisfactory. European also rose. Among more distant undertakings, the Australians were higher, owing to a better state of things generally there. Very little was done in Water; but the tone was favourable, and all variations in quotation are upward.

The daily operations were: Gas was active on the opening day, especially Gaslight issues of all descriptions. Continental Union rose 3; South Metropolitan "A," 1; and European, ½; but Gaslight "A" fell 2. West Middlesex Water gained 1. Tuesday was quieter; and quotations did not move. Wednesday's transactions were very light. British receded 1; but Australian rose 4; and Melbourne, 1; East London Water debenture advanced 2. There was more activity on Thursday, especially in the heavier issues. Imperial Continental fell 2. Friday's tone was favourable, except for Gaslight "A," which dropped 2½. South Metropolitan "A" rose 2; and the "B" and "C," 1 each. Continental Union preference gained 3. East London Water debentures advanced 4. Saturday was quiet; and prices did not move.

ELECTRIC LIGHTING MEMORANDA.

Troubles at Bristol—From Contractor to Consultant—Street Culvert Explosions.

IN a news paragraph which appeared in the last issue of the JOURNAL (taken from a local source), it was stated that Bristol had made a "record" in the matter of electric lighting. This statement receives startling explanation in a report that has since come to hand of the proceedings at the last meeting of the Bristol Town Council, when Alderman Pethick presented a communication from the Electric Lighting Committee, confessing to the melancholy fact of their having been utterly misled as to the cost of the central station, in consequence of which they have "overrun the constable" to the tune of something more than £20,000. It is a significant circumstance that a local newspaper has published a scathing article on this subject, entitled "Making a Clean Breast of it." But the Electric Lighting Committee are not absolved from blame on this account; for it appears that they kept their uncomfortable secret as long as they could, and only took the public into their confidence when it had become necessary to ask the ratepayers to "pay the piper." The trouble seems to have arisen in the usual way. Mr. W. H. Preece was the electrical adviser to the Corporation; and upon his report the Committee thought the necessary work could be done for £66,000. In this estimate, "buildings" figured for £5000; but this item was, of course, not for an electrician to deal with otherwise than generally. However, the Committee seem to have gone into bricks and mortar without a second thought, with the proverbial result of beginning to build before sitting down and counting the cost. Instead of £5000, their central station cost them £24,000 before it was finished. Mr. Preece was responsible for the selection of the site; but the Committee cannot be excused for not taking other advice on the subject. Indeed, they made blunder upon blunder in this matter, to the lasting discredit of the principle of municipalism in this part of the world. But there is more in the story of the Bristol "record" than a tale of mistakes in

building. The Town Council hoped that, when they had done all that Mr. Preece wished them to do, they would be able to sit down with a closed capital account, and rake in the business without further outlay or trouble. Here again they are disappointed. Alderman Barker declares that he was led by Mr. Preece to believe that the ultimate extension of the system, so as to cover the whole borough, was kept in view, so that all that would be necessary to do when the time came would be to lengthen the mains. This has now turned out to be another mistake; and "in case of extension to fresh districts it would be necessary to lay new mains, to take up all the streets again, in addition to which they would have to incur the cost of laying the extra mains." Well might Alderman Dix declare upon all this that "the Council are in for a losing game." Meanwhile, the Council have agreed to do what is necessary to put the undertaking upon a fair basis, by borrowing £24,000 for additional capital. The ensuing year's working of the station will be watched with interest.

Another chapter in the interesting story of the development of the electric lighting industry in England, under the distinguished patronage of Mr. Robert Hammond, has been opened at Coventry, where the Corporation have decided to start a central station of their own. It appears that the Corporation had two tenders for the necessary plant sent in, by the Brush Company and by Messrs. Hammond and Co., with Messrs. John Fowler and Co., Limited, of Leeds, respectively. The Corporation consulted Mr. A. H. Preece as to these tenders; and he recommended their acceptance of that of Messrs. Hammond and Fowler. Thereupon the Corporation received a further communication from Mr. Robert Hammond, offering to retire from the position of co-contractor with the Leeds firm, in order to act as Consulting Engineer to the Corporation; thus leaving Messrs. Fowler to carry out the contract under his supervision. The astonishing thing is that the Electric Lighting Committee proposed that this arrangement should be carried out, in order that the Corporation might have "the advantage of the assistance of Mr. Hammond's great experience and energy in carrying out the works;" and that the Corporation should then have actually agreed to the recommendation. The matter did not pass without some little discussion in the Town Council; and the Mayor admitted that the arrangement was a "curious" one. Curious is hardly the word for it—it is *opéra-bouffe* policy. But so long as the good people of Coventry are satisfied, nobody else need complain. Messrs. Fowler and Co. might, in all probability, be trusted to carry out any contract properly and conscientiously, with or without the supervision of a consulting engineer, and so the farcical "arrangement" in question is hardly likely to do either good or harm. It is to be hoped, however, that the novelty of turning a contractor for public works into a consulting engineer for the same job, as carried out by somebody else, will not become customary.

The strictures of the *Electrical Review* upon the responsibility of electricians for explosions in street culverts and boxes have not been allowed to pass without protest; and Mr. R. E. Crompton for one declines to admit that these unpleasant occurrences can be due to anything else than accumulations of coal gas. The fact of the matter is that there is no evidence to prove the origin of the explosions that have already taken place; and it is therefore open to anybody to say what he pleases on the subject. Of course, our contemporary is ready to agree that Mr. Crompton's mains are excellently laid, and to confess that "the fact that Mr. Crompton's mains have performed their work for years without one single case of an explosion, is a proof that he has succeeded in designing a system in which the various ways of producing such disasters have been studied and rendered next to impossible." All the same, supposing gas to find its way into a junction-box, how does it get ignited? In the Glasgow case, Mr. Arnot, the Manager of the local electric light works, says that the mischief "was caused by a leakage from the gas-mains, ignited by a spark from punctured test wires." Of course, two wrongs do not make one right; and when punctured electric wires enter into a combination with leaky gas-mains or service-pipes, the natural result is not to be helped by piling the blame upon one element. It is not to be denied that gas mains and services do leak here and there—generally on too small a scale to be detected by ordinary tests, but enough to give trouble if opportunity for the collection of the leakage in a closed chamber is put in its way, instead of its being left to diffuse harmlessly in the air. It is not an uncommon occurrence for a passer-by to perceive the smell of gas in a road, where by any means a gas-pipe has become fractured; and, upon warning being given, the leak is attended to without consequential trouble arising. Where there is a longitudinal culvert near, ready to collect escaped gas, the casual leak from the gas-main becomes far more dangerous. The main was there long before the culvert. It is the latter that renders it formidable in the event of a crack or drawn joint; and to put on the gas all the blame for an explosion, and say nothing against the agency that sets fire to it, is not fair.

The Secretaryship of the Crystal Palace District Gas Company, rendered vacant by the retirement of Mr. Magnus Ohren, has been filled by the appointment of Mr. Charles M. Ohren, who has been assistant to his father for a considerable number of years, and has been in the Company's employ from boyhood.

THE LABOUR QUESTION IN FRANCE

THE sixth volume of Foreign Reports issued under the authority of the Royal Commission on Labour deals with France; and it is in all respects a worthy pendant to its precursors. It should be mentioned that these reports are compiled by Mr. Geoffrey Drage, the Secretary of the Commission, and are published in connection with their proceedings; but the Commission have nothing to do with their preparation, and are in no way responsible for the statements of fact or of opinions which they contain. This announcement is plainly made in a printed slip inserted before the title-page of every volume; and we mention the fact here because a furious onslaught has been made upon Mr. Drage in the *Daily Chronicle*, apparently at the instigation of some Trade Union officials, on account of a portion of the matter contained in this very French report. Mr. Drage is accused of having been "insolent" to certain French politicians, by the reflections he has made upon the origin and conduct of certain strikes of French coal miners, which were discussed in the JOURNAL at the time of their occurrence; and the newspaper already named thought fit to advise the Government to withdraw the report from circulation on this account. The Government have not sunk so low as to obey every bidding of the New Unionists; and the report remains on sale, greatly to the disappointment of the *Daily Chronicle*, which has now turned upon Mr. Drage personally, and asserts that "his age and training unfit him for a serious investigation of any aspect of the labour question." Of course, no remark of this nature would apply to the newspaper writers and demagogues who set themselves up as authorities in these matters. We will not do the able and industrious Secretary of the Labour Commission the disservice of championing him as against any newspaper scribbler who may receive a cue to attack him; but it certainly appears that things have come to a pretty pass when strike leaders, either at home or abroad, claim to be spoken of with bated breath. It may not suit Mr. Pickard to see the ways of his French compeers coldly noted and discussed on their merits. But whatever Mr. Drage has done in this regard, he has done on his own responsibility, and, we are assured, with no other object than that of giving an intelligible and reliable statement of occurrences the true character of which it doubtless suits the wire-pullers of "Labour" to conceal.

After all, the "head and front" of Mr. Drage's "offending" would hardly be discovered by any reader of his volume on France who did not happen to be primed by the new Unionists. He had to recount the history of a series of strikes, which were admittedly and notoriously of a political colour. There was a scandalously open connection between these events and the manœuvring of a particular section of members of the Chamber of Deputies; and political considerations made the Cabinet of the day blow hot and cold at once in their dealings with murderous strikers. Mr. Drage merely notices the fact, and remarks upon the parts played by certain French politicians who were responsible for the preservation of order. It was not he who made the French Miners Socialists, and supplied politicians with their reasons for dabbling in what were ostensibly industrial complications. Such Trade Unions as exist in France and the Labour Exchanges connecting the working-class voters with communal and municipal political parties, are dominated by politics. It is impossible to treat of these organizations without noticing that they are more political than anything else. The New Unionism in this country is going in the same way, as fast as the wire-pullers can drag it. The older Trade Unions used at least to leave politics and religion alone; and their executives never sought to interfere with the freedom of action of their members in these respects. This tolerance is now styled old-fashioned; and the New Unionist leaders aim at controlling the voting power and the very souls of those whom they can make their dupes. This is so far only the programme in England; but in France it is an accomplished fact, to be recognized by every thoughtful observer of the condition of the labour question in that country. Mr. Drage endeavours to explain the matter by referring to racial characteristics; and this is one of the points upon which he has given mortal offence to the paragons of wisdom, public virtue, and learning who direct our Miners Federation—for a consideration.

It is not our intention to follow Mr. Drage through the semi political review and discussion of the French Labour Question which constitutes the introductory portion of his report. It really is no more political than the similar work on Germany, only politics in France are so much more individualized than is the case in Germany, where the ruling dynasty, as in the United Kingdom, keeps the personalty of politicians in a lower place. Moreover, the separation and mutual distrust of the different orders of society in France is much more marked a feature of the communal life than in either Germany or England. These and many other considerations, set out in a manner that is both interesting and instructive by Mr. Drage, make this political portion of his report an indispensable preface to the detail statements referring to the condition of the workers, although it is a little outside our scope.

For the reason that will appear from what has gone before, the history of French strikes has not much instruction for employers and employed of other nationalities, excepting in so far as they illustrate the mischievous consequences of mixing

up industrial with political questions. A French Trade Union is called a "Syndicate." There are syndicates of employers as well as of workmen, and there are also mixed syndicates of both orders, from which much is expected by those who desire to take the venom out of the unmitigated Socialism which is the only ideal of the working classes. The employees in every important trade are "syndicated;" but, as in England, the organized members of every trade are in a minority. Thus, out of 15,000 gas workers, only 6315 are ranked as belonging to registered syndicates.

After all, the best part of the report is that which deals with profit-sharing, which had its origin in France. Curiously enough, co-operation does not flourish well in the same soil, although specially favoured by the Government. The "advanced" spirits at the Labour Exchange repudiate the co-operative movement, as they do profit-sharing; they stigmatize both as inimical to the syndicates—that is, to Trade Unionism. For their part, the leading co-operators are equally hearty in dissenting from the Collectivist, or extreme Socialistic party. There are a good many interesting co-operative experiments in progress in France; but the most successful appear to have been built upon previously existing businesses, the governing spirits of which have remained to look after the common interests. Workmen in France, it is remarked, do not care to be governed by their equals, and do not thrive under such a condition. The most famous productive co-operative undertaking of France is the "Familistère de Guise," a manufactory of stoves, furnishing ironmongery, gas apparatus, &c., originally founded by M. Godin "under the influence of the ruling ideas of the Revolution of 1830." Since its reorganization from a private firm into an "integral association of capital and labour," the success of this undertaking has been unbroken. The founder died in 1888; but his death made no break in the affairs of the Society. M. Duquenne was elected for life in his stead as Managing-Director, in accordance with statutes drawn up in 1880. Mr. Drage details the way members of the society are paid and the profits divided. Co-operative producing societies are a step in advance of profit-sharing undertakings; for in certain instances the latter have passed into the former.

The Paris Gas Company are named by Mr. Drage as having lately made important arrangements in favour of their workers. The particulars of the Company's scheme are published in "La Réforme Sociale" for May 1 last. It is stated in the report that for a long time the head workers of the staff have had a share of 1 per cent. in the profits, and special advantages in the way of aid to pension and provident funds. This year the Company have determined to extend these advantages to the workmen. These are henceforth to receive 2 per cent. on profits, based on the number of days of labour, not on the amount of wages. Widows and orphans are to have a share in the pension and provident funds; and the Company have even made provision for a reserve fund for such purposes, to come into operation in 1906, the year of expiration of their treaty, in the event of the concession not being renewed. This fund will receive an annual subsidy of 80,000 frs. The provident fund supplies medical aid for the sick and accident cases. It is formed by retaining 1 per cent. of the workmen's wages and an equivalent contribution by the Company; all working expenses being borne by the latter. The pension fund has been maintained, without any levy upon wages, by gifts from various administrators, and by contributions from the Company. The Company also provide scholarships to their workmen's children in different technical schools. A powerful Federation of Co-operative Societies has been formed by the employees of the Paris, Lyons, and Mediterranean Railway Company; but the leading association of the kind is the Society called "L'Abeille Nîmoise." It is estimated that this Nîmes movement has had considerable influence upon co-operation in France generally. It is this school which corresponds in a measure, Mr. Drage says, to the Socalist wing of the English co-operators, and which is inclined to subordinate associations for production to the Consumers' Associations, as representing wider interests. Consumers' associations powerfully organized are the indispensable conditions, they hold, of productive associations, for they alone can supply the three elements of success which have hitherto been lacking—namely, managers, capital, and markets.

Profit-sharing is defined by M. Charles Robert, who is said to be the greatest living authority on the subject, as "an agreement, express or tacit, by which the industrial, commercial, or agricultural employer gives to his workmen, in addition to their regular salary, a share in the profits without a share in the losses." M. Chaise regards it as an essentially preparatory *régime;* and Mr. Drage remarks that this opinion as to the transitional nature of the idea is fully borne out by the actual history of the four great early attempts at profit-sharing, which all in time adopted a mainly co-operative basis. Meanwhile, M. Robert says it is essential to the success of profit-sharing that the workpeople should have no control over the accounts.

Mr. Drage has much to say on the question of employers' liability, which has long been before the public in France. As the law stands, there is no distinction of persons who are liable to accidents—in short, the doctrine of common employment has no existence. On the other hand, the sufferer has to prove that an accident has occurred through the fault, imprudence, or negligence of the employer or his officials; and, as a result, 75 per cent. of the cases go uncompensated. This is not regarded as satisfactory; and a scheme is now under consideration for compulsory workmen's insurance something after the German model. Many other points connected with labour are dealt with in this report, which, like the others of the series, is a mine of information respecting the subjects of which it treats, and is very well arranged.

STATUTORY POWERS AND THE COMMON LAW.

An article under the above title, which recently appeared in the *Law Times*, touches indirectly upon a question of considerable moment to water companies and other public bodies assuming to act in pursuance of special statutory authority. The lax phraseology so often introduced into Private Acts of Parliament has been a fruitful source of litigation. Take, for example, the uncertainty which prevails with regard to the right of certain companies to charge extra for water supplied to fixed baths; or the yet wider question whether, in some instances, a company's charges for domestic supply are to be governed by the gross rental or by the assessment to the poor-rate. The *Law Times* article, it is true, touches upon certain decisions relating to railway and tramway companies; but these decisions tend to show how explicit the terms of an Act of Parliament must be if they are to override obligations imposed by common law. Of course, the principle adopted in construing the Special Act of a railway company must also prevail in regard to the statutory powers of a water company, or any other body whose statutory mission runs counter to the every-day law of the land. The position is well illustrated by the case of the North London Tramways Company. That Company obtained special powers enabling them to construct and maintain certain tramways extensions, "with all proper rails, plates, works, and conveniences connected therewith." Acting, as they believed, within the scope of this authority, the Directors bought land and erected stables for the accommodation of their horses. But the neighbours complained of a nuisance, and sought an injunction from the High Court. Clearly, the Act empowered the Company to have stables, as a necessary convenience in connection with their tramway system. But did it mean that the Company might do what, in the Directors' discretion, was deemed proper, provided they took all reasonable care to avoid committing a nuisance? Or was the Act merely intended to authorize the Company to have stables where they could not occasion a nuisance; in other words, provided nothing was done inconsistent with the common law? In this latter, the narrow and restricted sense, the terms of the Act were interpreted by the Court of Appeal.

Of course, at common law, it is no defence for a company or an individual to say that all reasonable care has been taken to prevent a nuisance, and therefore it does not matter if, in fact, the common law be disregarded. But, as Lord Justice Lindley pointed out, an Act of Parliament may afford a good defence. The Act of Parliament, however, must be clear and explicit in its intentions and terms. At the present time, numerous companies in whose affairs the readers of the Journal are interested are seeking further parliamentary powers; and it certainly behoves the promoters of the various Bills to pay careful heed to the obvious lesson which our contemporary deduces from the decision above cited. To have a clear intention will be of no avail, unless it be clothed in apt phraseology; for, as the *Law Times* concludes, the intentions of the promoters are by no means certain to be judicially regarded as equivalent to the intentions of the Legislature.

The Management of the Metropolitan Gas Companies.—In the House of Commons, last Friday, Mr. J. Rowlands presented a petition from St. Luke's Vestry, praying that the House would be pleased to direct an inquiry into the present management and working of the various Gas Companies of the Metropolis, and as to their existing statutory rights, and the past results, financial and general, of the statutory sliding scale of price and dividend, with the object of a Bill being subsequently introduced to provide for reducing the standard price and statutory limit of dividend now authorized to be charged and paid by the Gas Companies, and for a uniform charge throughout the Metropolis for all gas supplied, to include the free use of meters.

The Salford Corporation and the Hunter Compact.—Among the cases set down for trial at the Manchester Assizes which ended a few days ago was an action brought by the Corporation of Salford against Samuel Hunter, their former Gas Manager. It had reference to the payment of certain costs arising out of the notorious "Gas Scandal;" but its hearing was somewhat mysteriously postponed until the next Assizes. The costs in question are alleged to be part and parcel of the agreement by which the Corporation, in consideration of the payment of £10,000 and certain costs, undertook not to bring any action against Hunter and several coalowners. Some money has been recovered by the Corporation under this agreement; but they are said to still require £500 for costs, which Hunter refuses to pay. We understand that one reason for the postponement of the action is that, if it had been heard, it must have been tried by Mr. Justice Day, who on a former occasion pronounced the agreement to be *ultra vires*, and against the public morals. Hunter's refusal to pay the money is understood to be based on this pronouncement against the legality of the compact.

NOTES.

A Guide for Gas Consumers.

The United Gas Improvement Company, of Philadelphia, have issued, for the instruction of the consumers supplied from their various works, a cleverly prepared illustrated circular, giving full particulars of the way in which gas should and should not be burnt from the flat-flame burners in common use, in order to give the best results for the quantity consumed. The point upon which stress is laid in the illustrations, which are reproduced from photographs, is the shape of the flame. This is a matter upon which any consumer who has once had his attention properly directed to it is able to form an opinion; and the method has the advantage of not complicating the lesson sought to be conveyed by considerations of pressure, &c., which are not understood by the people. Thus the object of the circular is stated to be "to guide the consumer to an economical use of gas, and to illustrate the difference in economy between a gas-flame of proper shape and a flame of any of the wasteful shapes;" and it is remarked that "if the flame is not of the proper shape, the result is apt to be smoked and broken globes, unsatisfactory illumination, unnecessarily large gas bills, and a general complaint of poor gas." The consumer is then warned that the use of a burner of nominally small size does not necessarily mean a small consumption, inasmuch as it is possible to pass through any such burner more than double the rated quantity of gas with bad results upon the duty yielded by the gas so burnt. The starting-point chosen for illustrating the proper use of gas is a No. 6 burner turned down so as to consume only 5 feet cubic of gas per hour, when the flame is shown to be of the correct petal form, with the blue portion almost truly circular, and the base without horns. The Company appear to find it necessary to issue "burner cleaners" to consumers free of charge, which is hardly to be wondered at if, as represented in their circular, the gas supplied is of such a quality that the pattern flame gives an illuminating power of 24 candles.

Smoke-Washing for Profit.

Nothing has been heard of late of Elliott's smoke-washing apparatus, which was exhibited some time ago on an experimental scale on a vacant piece of land on the Thames Embankment. The inventor appears to have been engaged in the interim in improving the mechanical part of his appliance; and its latest form was recently shown in action at the Birmingham Mint, as applied to a chimney that has long been a source of trouble to the firm, and an annoyance to owners and occupiers of the adjoining property. Mr. Elliott's perseverance certainly merits recognition, and more material recompense than it is likely to receive in the estimation of those who fail to see in smoke-washing a perfect remedy for the evils with which the process is intended to cope. The apparatus is described as consisting of a chamber of moderate dimensions, into which the smoke is drawn by a high-speed fan. This chamber is fitted with revolving perforated paddles, which dip a few inches into water, and so churn the smoke with the water as to cause the latter to absorb from the smoke all its acid and dusty constituents. The resulting product is a frothy black fluid from which a putty-like sediment is collected. This is characterized as able "to command a sale amongst printers' ink and pigment manufacturers;" and the liquid portion of the residue is stated to be "also valuable, being highly charged with chemical qualities," which is rather vague.

The Effective Duty of Oil and Other Fuels.

Speaking on oil fuels at the last meeting of the Manchester Section of the Society of Chemical Industry, Mr. George E. Davis stated that a large number of oil-burners had been used during the coal strike, and their sudden disappearance with the resumption of the ordinary coal supply proved more than any argument he could use that oil is less advantageous than solid fuel. Mr. Davis then briefly described the various oil-burning arrangements that had been adopted as a consequence of the scarcity of coal, and gave the following as the result of his own experiments with different kinds of fuel—the air supply being carefully regulated in every case by the proportion of carbonic acid in the flue gases. The quantities of fuel to give the same heating effect were: Coal, 1456 lbs.; coke, 1624 lbs.; debenzolized gas, 25,000 cubic feet; creosote, 831 lbs. In using spray burners, Mr. Davis found the regulation of the draught a most important point. His own impression, formed from the results of many experiments, was that the best way to burn liquid fuel on an industrial scale is by means of compressed air.

A Modification of the Platinum Standard of Light.

A report has been issued by the Imperial Laboratory of Berlin on the use of fused platinum as a standard of light. M. Violle's proposal to make the standard unit of light by using for this purpose the luminous radiation from a square centimetre of the surface of incandescent platinum at the point of solidification, has been nominally adopted for the purposes of international science; but practically the standard is never used. There are many objections to it, not the least being the necessity of perfect purity in the metal, and that there should be a considerable quantity of the metal in the molten state. With all precautions, an error of 10 per cent. is very frequently present. The Imperial Laboratory has endeavoured to standardize the radiation of platinum independently of its melting-point. It has been ascertained that at a certain fixed temperature the proportion of the total radiation which is transmitted through a thickness of pure water of constant measurement is always equal to 2 per cent., whatever the thickness of the platinum. In order to measure the amount of luminous radiation, a sensitive bolometer is employed; but the process is open to the objection that it is not light which is measured, although this is supposed to be a standard of light.

TECHNICAL RECORD.

THE REMOVAL OF TAR FROM GAS.

At the recent Meeting of the German Association of Gas and Water Engineers at Dresden, Dr. W. Leybold read a paper on the above subject. The text was given a short time ago in the *Journal für Gasbeleuchtung;* but the paper has been printed separately, and a copy has been forwarded to us, from which the following abstract translation has been prepared:—

Little short of perfection has been attained in the separation of tar from illuminating gas in modern times. A considerable portion of the tar made is deposited in the hydraulic main, a further quantity in the condensers, and the remainder in the washers and scrubbers. The purifying material absorbs any that may have passed the latter vessels. The Vienna Exhibition of 1873 contained an apparatus invented by two French Engineers—MM. Pelouze and Audouin—for the thorough removal of tar from gas. It contained five cylinders rolled from as many freely-perforated metal plates. The cylinders were of such diameters that, when packed co-axially, there were intervening spaces 1 millimetre in width; and the perforations in the plates also were 1 millimetre in diameter. The upper ends of the cylinders were closed by a plate; so that the whole formed a bell-shaped vessel, the lower and open end of which dipped under tar contained in a cup in the lower part of a cylindrical cast-iron box. The latter was provided with inlet and outlet pipes for the gas, and a door for admitting or withdrawing the bell when required. A small gasholder attached to the case was connected to the bell, so as to raise or lower it according to the pressure of the gas passing through. The tar separated flowed over the rim of the cup, and was removed by a pipe from the outer box. Stress was laid on the proper cooling of the gas prior to admission, in order to avoid deposition of naphthalene in the apparatus.

In 1874 the first plant was erected at the Paris Gas-Works. It was capable of treating 20,000 cubic metres (about 700,000 cubic feet) per 24 hours; and it acted satisfactorily. At Frankfort a heavier gas is made; and as some of the tar was carried through the washers into the purifiers, a Pelouze tar-extractor was placed between these vessels, and worked well from the close of 1874 to 1889. The coke and faggots in the washers frequently, however, became choked by the tar; and it was evident that the latter should be removed before the gas entered these vessels. The bell, consisting of finely-perforated plates lying close to one another, rapidly choked, and could be cleaned only by taking it entirely to pieces—a work of much labour. In some respects the Frankfort apparatus was an improvement on that erected in Paris. The regulator was considerably reduced in size; and it could be balanced by weights so as to give the bell such depth of seal as might be desired under fairly uniform pressure. In 1878 certain improvements were made on the bell, which constituted the apparatus such as it substantially remains to-day. It was found that the repeated beating of the stream of gas against the surfaces had no greater effect than one or at the most two impacts; and consequently the small sizes were made with one plate, and the larger bells with two. The cylindrical shape was abolished in favour of a square or an octagonal form, for ease in fitting the plates. Where two of these were used, the inner one was perforated in rows of small holes; the outer containing horizontal slits facing the spaces between the rows of perforations in the inner plate. The cup in which the bell floated was, in the improved apparatus, united with the outer casing.*

The apparatus possesses the very considerable advantage of accommodating itself to the pressure, and consequently to the quantity, of gas passing through it. Should some of the perforations become clogged, the bell rises to allow the gas to pass freely. The obstructing matter can be dislodged by admitting steam at the inlet-pipe, until the outlet has reached a temperature of about 35° C. At Frankfort, this is done regularly twice a week. In winter, when the apparatus is exposed to low temperatures, a small quantity of steam may with advantage be admitted continuously with the gas. If this is not done, the tar, being less fluid than in warm weather, blocks up the perforations in the plates. Twice a year the bell should be removed and cleaned by immersion in some light oil, and by subsequent scrubbing. A bell should be kept in reserve, to take the place of the one in use when the latter is removed for cleansing. The thick tar that subsides to the

* Illustrated desriptions of MM. Pelouze and Audouin's appliance will be found in the JOURNAL, Vol. XXIV., p. 445, and Vol. XXVIII., p. 632.

bottom of the cup should occasionaly be ladled out. Tar, not water, should be put into the cup on starting again after cleaning. The plates work better with a thin coating of tar than when they are perfectly clean.

The working of the two Pelouze extractors in the Frankfort Gas-Works was closely observed during the year 1889. The tar removed by them in 24 hours was weighed, and that remaining in the gas was estimated by passing a measured volume of the latter through weighed tubes containing glass wool; the moisture being subsequently removed from them by a stream of dried air. The results show that the gas contained 9·6 kilogrammes of tar per 1000 cubic metres (nearly 0·6 lb. per 1000 cubic feet), which was removed by the apparatus. The outlet gas from one extractor contained 59·7 grammes of tar per 1000 cubic metres (26 grains per 1000 cubic feet); that from the other, 62·8 grammes per 1000 cubic metres (27·5 grains per 1000 cubic feet). This gives an efficiency for the apparatus of 99·5 or 99·4 per cent. Experiments were carried out in other works, partly by the author and partly by the managers. These show a very high efficiency for the Pelouze extractor; over 98 per cent. of the tar in the gas entering it being removed in all cases where it precedes the washers. At Mannheim, where it follows the washer, a smaller percentage of the tar entering the apparatus is removed; but as the inlet gas contains but little tar, it is scarcely fair to expect the percentage removed to be as high as when the extractor deals with gas more heavily loaded. This leads to the consideration of the proper place in the series of apparatus for the Pelouze extractor. Where scrubbers charged with coke or faggots precede the extractor, they frequently become blocked by accumulations of tar, and then they throw great pressure. When the extractor precedes the exhauster, air is liable to be drawn into the gas by the increased vacuum required to pull it through the apparatus; and the occasional blocking of perforations in the bell causes a varying pressure to be thrown on the hydraulic main. It appears, therefore, that the proper position for the Pelouze extractor is after the exhauster and before the washers. About 800 tar-extractors on the Pelouze and Audouin system are now in operation; the largest being at Stockholm, where it was erected in 1892 for the treatment of 60,000 cubic metres (a little over 2 million cubic feet) of gas daily. Apparatus of slightly smaller capacity has been erected at Leipsic, Berlin, Warsaw, Copenhagen, Hamburg, and other places.

Another apparatus, the main purpose of which is the removal of tar, is the Drory tar-washer. This has been devised upon the same principle as the Pelouze extractor. The area of the plates, however, is increased by arranging them radially; and in the washers recently made, the gas passing through each slit in the plate is divided by a metal strip into two streams. There are two chambers, into the first of which the gas enters through a perforated plate on which water runs, and is deprived of some of its ammonia. Into the second, containing the bell, water also plays; and the level of the liquid in both chambers is regulated by a Drory outlet. In the early specimens of the Drory washer, the pressure on the bell was controlled by a spiral spring; but in recent apparatus the method of regulating pressure adopted in the Pelouze extractor is employed. The Drory tar-washers at the Metz and Ludwigshafen works were experimented on in the same way as the Pelouse extractors at Frankfort. Each washer was capable of passing 15,000 cubic metres (530,000 cubic feet) per day, and removed more than 99 per cent. of the tar from the gas entering it. At Metz, 14·5 per cent. of the ammonia in the inlet gas was also removed; at Ludwigshafen, 37·9 per cent. Both the Pelouze extractor and the Drory washer appear to the author to be admirably adapted for removing tar from gas.

THE GRANGER STEAM-JET NOZZLE.

The advantages resulting from the adoption of forced draught for boiler and other furnaces are now fully recognized by those engineers who have had actual experience in the matter; and as managers of gas-works usually have a quantity of cheap refuse or dust fuel available for firing purposes, the subject is of some importance to them. There appears to be ample evidence showing that when slack is burnt under a strong or "forced" draught, it will, weight for weight, produce as much steam as the best large coal will do under natural draught; while with coal dust and breeze, the evaporative efficiency averages from 60 to 80 per cent. as compared with that of large coal. The various systems of forced draught in use may be classed under two heads—viz., (1) those in which fans are employed to promote the draught; and (2) those in which steam-jets are used for the purpose. The former systems are admitted to be highly efficient; but they are likewise expensive, both in first establishment and in maintenance. There is also frequent trouble arising from the burning away of the fire-bars owing to the intense heat produced. The jet systems, however, possess several advantages, chiefly due to simplicity, small space occupied, low first cost, inexpensive maintenance, and preservation of the fire-bars. Although so many different types of steam-jet apparatus have been designed, the jet or nozzle itself has not hitherto undergone any improvement. It consists usually of a plain round hole drilled in a piece of brass, and occasionally of a jet issuing from an annulus formed by a round hole more or less closed by a tapering plug, moveable lengthwise in it, for the purpose of adjusting the area of the annulus. As this class of jet has been rather a favourite one with the inexperienced, it will be well to mention here that such jets, used alone, are considerably less efficient than plain solid ones of equal area; their steam consumption varying from about 20 to 100 per cent. more, according to size, pressure, &c., for the same duty. This weakness is probably due to the want of solidity inherent in this form of jet. Recently, however, an entirely new nozzle has been introduced by Mr. W. A. Granger, of which we give illustrations below. It is one of the neatest and best-made appliances of this kind that has come under our notice, and is the outcome of many experiments aimed at determining the most suitable proportions of outlets for obtaining the highest results for the quantity of steam used.

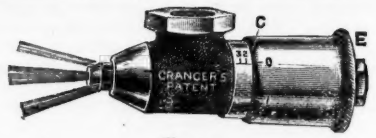


FIG. 1.

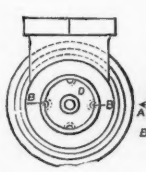


FIG. 2.

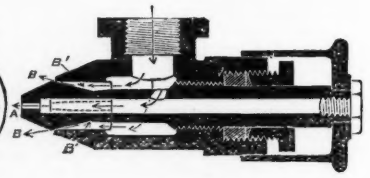


FIG. 3.

The injector is shown in fig. 1; fig. 2 being a front view, and fig. 3 a longitudinal section. In addition to the centre jet, there are three auxiliary ones surrounding it (in the drawing, four are shown for the sake of clearness), and issuing from three tapering grooves cut in the plug or spindle in such manner that as the plug is moved towards the left hand the larger these jets become, by reason of the larger end of the grooves being more exposed. In this way the effort of the centre jet is more or less assisted or supplemented by the side jets, till, when the latter are fully opened, the blast is about three times stronger than that given by the former when acting alone. The movement of the plug is effected by turning the milled rim E (fig. 1); while graduations are provided at C for showing and defining the extent to which the auxiliary jets are opened. The grooves are so shaped as to give the jets as solid a cross section as possible at all positions of the adjustment. It will be seen that in this nozzle there is the great practical advantage of a ready means of regulating the power of the blast as may be necessary from time to time to meet the varying demands upon the boiler or the changing conditions of the fire, &c. Further, should the steam pressure with which the nozzles are worked fall considerably, the blast may still be retained at its normal strength by opening the side jets to the required extent. With the common steam-jet, there is no adjustment obtainable except by the crude method of throttling the steam supply by means of a cock or valve; but this operation effectually robs the jet of its vigour or force of impact, upon which its action depends.

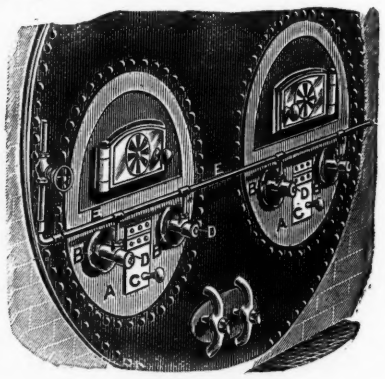


FIG. 4.

The nozzles are usually applied as shown in fig. 4, where the ash-pits are closed by covers A through which pass two air-tubes B, projecting two or three feet into the ash-pits, and having the nozzles D fixed so as to blow into them for the purpose of inducing a strong air current or blast to flow through the tubes into the ash-pit, and thence through the fire-bar spaces to the fire. The small doors C are for the removal of dust and ash, the quantity of which is, however, very small, both in size and quantity, owing to the narrowness of the fire-bar spaces employed,

In the form we have illustrated, the Granger steam-jet nozzle is intended for forcing the draught of steam-boilers burning slack or refuse fuel, for which purpose the appliance is being extensively adopted at large collieries in different parts of the country; but as its atomizing effect is claimed to be preserved under extreme variations of pressure and rate of delivery, it is useful for burning tar, carbonizing oil, &c., with suitable connections.

PERSIAN COAL.

According to Herr A. F. Stahl, writing in the *Chemiker Zeitung*, Persia is rich in coal, though the hopes of industrial activity which its occurrence have raised are not yet realized. The seams are not confined to one district, though only those in the neighbourhood of Teheran have been worked to any considerable extent. For the most part, the coal crumbles freely, and rapidly disintegrates on exposure to the air; moreover, it contains a large amount of pyrites. The best pit is perhaps that in the Chio Valley, where there are 16 seams, from 2 to 4 feet thick. Various samples were examined, with the following results:—

No. 1, consisting of 30 per cent. of rich caking coal, 10 per cent. of poor non-caking coal, and 60 per cent. of incombustible black shale, when powdered, yielded on dry distillation 12 per cent. of volatile matter and 88 per cent. of coke. On combustion, 30 per cent. of ash remained.

No. 2, consisting of 10 per cent. of rich caking coal and 90 per cent. of poor non-caking coal, gave on dry distillation 20 per cent. of volatile matter and 80 per cent. of unfluxed residue. On combustion, 30 per cent. of ash was left.

No. 3, a short-flame, poor non-caking coal, gave on dry distillation 19 per cent. of volatile constituents and 81 per cent. of unfused residue. It contained 50 per cent. of ash.

No. 4, a rich caking coal of dull black colour, yielded on dry distillation 31 per cent. of volatile matter and 69 per cent. of coke, with 9 per cent. of ash.

No. 5, a mixture of 90 per cent. of poor free-burning coal and 10 per cent. of caking coal, gave on dry distillation 28 per cent. of volatile matter and 72 per cent. of slightly fused coke, with 27 per cent. of ash.

No. 6, a rich caking coal, containing 2 per cent. of slate, yielded on dry distillation 27 per cent. of volatile matter and 73 per cent. of coke, with 10 per cent. of ash.

These samples fairly represent the character of the coal brought to the Teheran market; but the supply hardly meets the local requirements. This is not due to scarcity, but to the carelessness of the mine owners, who will not take the trouble to place only good coal on the market. The price obtained in Teheran is about £3 15s. per ton. Mining operations are carried on by very primitive methods; the pick being almost the only tool used in winning the coal. As the small is refused by buyers, not more than 30 per cent. is saleable; the remainder being wasted. The want of convenient and cheap means of transport is much felt; and this prevents the industry making rapid strides. Failing the cheapening of transportation, the discovery of workable seams on the seaboard must be looked to for the development of the coal resources of the country. But Herr Stahl's paper clearly proves that Persia cannot be regarded as poor in coal, though the lethargy of its people has hitherto prevented the utilization on a considerable scale of this source of wealth.

Paint as a Preservative of Iron Structures.—In the course of a letter recently published in the *Glasgow Herald*, Sir W. Arrol stated that he had had occasion to examine some of the material of the old Hammersmith Bridge, which he had purchased for the purpose of using it as temporary plant in the erection of the Forth Bridge. It had been up 62 years, and a great many of the parts had not been painted since its erection, as it was impossible to get at them; yet those parts were in a good state of preservation—in fact, were quite as good as when they left the works. Sir William took some of the material with which it had been painted, to ascertain the reason for the good state of preservation in which he found it; and the result of the analysis proved it to be genuine white lead.

Patents in the United States.—The United States Commissioner of Patents is required to make two annual reports on the condition of the Patent Office—one to Congress at the beginning of each year, and the other to the Secretary of the Interior in the middle of the year. The Commissioner's report to the Secretary, for the year ending June 30 last, has just appeared. It shows that 39,539 new applications for patents were made, 23,471 patents granted, 8283 applications were waiting official sanction, and the remainder stood rejected or requiring amendment. The total receipts were $1,288,809; and the expenses, $1,111,442. The Commissioner very strongly recommends a philosophical classification of the issued patents, in order to facilitate the work of official examinations; also the establishment of a more comprehensive scientific library.

REGISTER OF PATENTS.

Coin-Operated Device for Gas-Meters.—Glover, S. and T., and Critchley, J., of St. Helens. No. 18,238; Oct. 12, 1892.

This coin-freed apparatus for the delivery of gas and other fluids from meters, consists of a combination of a coin-quadrant and coin-lever, means for oscillating or partly rotating and returning the quadrant, a pawl on the coin-lever engaging with a ratchet-wheel, and a cam or device for releasing the pawl, constructed as shown in the engravings, and operating as follows:—

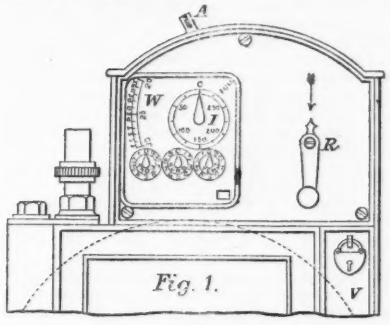


Fig. 1.

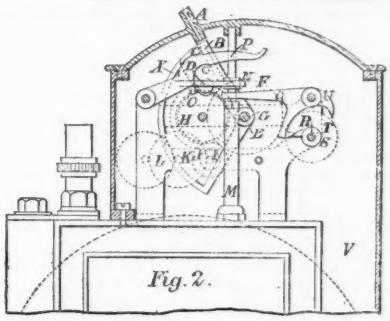


Fig. 2.

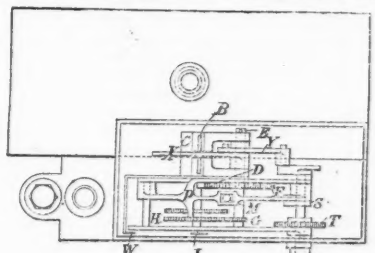


Fig. 3.

A is a slot, through which the coins are inserted; R, the handle by which the device is operated; and I, an index showing the consumer what quantity of gas remains for use as value for the coins inserted, and similarly what quantity of the gas paid for has been used. W is an index, which is set (before the apparatus is used) at the number of cubic feet marked on the index to be sold for 1d., or other determined coin; and V is the coin-box. The coin-lever C (shown in plan in fig. 3) is mounted freely upon the spindle E. It has formed in it slots B for the reception of one of the predetermined coins; and it carries the pawl D, capable of engaging with and driving the ratchet-wheel F, fixed upon the spindle E, so as to rotate that spindle in one direction only. The coin-quadrant X is also mounted freely upon the spindle E. Its front bar, which fits in a recess in front of the coin-lever, is the essential part of the quadrant; and it is connected by the link Y with a crank-pin, carried on an extension from the wiper fixed upon the spindle of the handle R. Upon this spindle there is also connected a ratchet-wheel T, with which the detent U (fig. 2) engages, so as to prevent any rotation of the ratchet-wheel except in the proper direction. The same spindle has also fixed upon it the wiper S, the function of which will be described later on.

To facilitate the fitting together of the coin-lever C and the quadrant and bar X in their relative positions upon the spindle E, the coin-lever is cast with its lower part forked; and upon the bar there are cast the co-axial bosses, one on each side of the bar. The limbs and bosses are bored to fit freely upon the spindle E. The opening through the quadrant is sufficiently large to pass the coin-lever C through it. It is passed through it so far that the limbs are in line with the faces of the bosses when the ends of the limbs are brought forward to bring their bore in line with the bore of the bosses; and the pair are then passed upon the spindle E, where they are secured by a pin or nut.

When the handle R is rotated without the insertion of a coin, the coin-quadrant will be ineffectually oscillated, and no result will occur. If, however, a coin be inserted in B, it comes in front of, and into the path of the coin-quadrant bar; and the coin-lever, with the coin therein, must partake in the motion of the quadrant. After the insertion of a coin, therefore, the handle is rotated through a complete revolution; and the coin lever and quadrant will have made a complete to-and-fro oscillation. At the end of the forward motion, there is a slight dwell—owing to the crank-pin being at the dead centre; and at this point, the wiper, rotating with the handle R, enters its point below the edge of the coin, and (by its continued motion) ejects the

coin from the lever. The curved part of the quadrant X comes into the path of a coin into the slot of the coin-lever, unless the handle is in one particular position (as in fig. 1); and it will, therefore, be impossible to insert a coin into the apparatus unless the handle is in that position. If this precaution be not desired, the curved part X may be omitted, leaving only the bar.

Assuming that the wheel F has a hundred teeth, and is rotated through the space of one tooth for each cubic foot of gas to be delivered, then a complete revolution of the wheel will determine the delivery of 100 cubic feet. As the stroke of the pawl affects only one-fourth of a revolution of the wheel, the amount of gas thus arranged to be supplied would be 25 feet. Should this be found to be too great a supply for 1d., then the index W is shifted until it points to the smaller quantity to be supplied. The index-finger is connected by an arm and lever to a cam, which is pivoted on E, under the pawl D; and, by the movement of the index, it is pushed forward, lifting the pawl, so that it does not come into engagement with the ratchet-wheel F, till this has passed over a number of teeth equal to the difference between the number of cubic feet to be supplied and the maximum number. Thus, if a full stroke of the pawl moves the ratchet-wheel through the space of twenty-five teeth to supply 25 cubic feet, and it be desired to supply 20 feet only, the cam is moved so far that the pawl misses engagement with the first five teeth. When the coin-lever and quadrant are returned to their position of rest, the pawl D is raised out of contact with the ratchet-wheel, so that this wheel is now free to be turned back by the ordinary counting mechanism of the meter.

The spindle E has fixed upon it a pinion G gearing with the wheel H, which can be driven by friction by a parallel co-axial wheel geared with the meter-spindle as usual. On a flange perpendicular to the wheel H, and formed integrally with it, or on an equivalent part, there is a recess O (fig. 2), into which a stop on the lever P can fall, when the recess is brought under the stop by the rotation of the ratchet-wheel F. The forward end of this lever has a square opening N formed in it (as shown by fig. 3), embracing the vertical spindle M of the ordinary counting mechanism. On this spindle, there is formed a square, in such a position that, when the lever P has descended, in consequence of its stop having fallen into the recess O, the square opening engages the square on the spindle, and further rotation of the spindle is prevented—thus stopping the continued delivery of gas. This stop-gear is released by a pin fixed upon the coin-lever C, in contact with the under side of P. When therefore the coin-lever is moved forward, the lever P and its squared eye N is lifted—thus removing the stop from the recess O, and the eye N from the square of the spindle M, and setting the meter free for the delivery of more gas.

As already described, the handle R can be turned in one direction only, as provided by the ratchet-wheel T and pawl U. To ensure that a complete turn is made by the handle for each coin inserted, a supplementary L-shaped lever is pivoted on the same stud or pin as the pawl U; and the forward end of it has a square eye formed in it, similar to, and for the same purpose as, the eye N in the lever P. It is, however, more convenient that the eye in O should engage with a separate square on the spindle M, below the square; so that, when the lever is lifted, the round part of the spindle between the squares can rotate in the eye. The wiper S is constructed to come into contact with, and move the lower limb of, the lever only when the handle is in the position shown by fig. 1. When it is thus placed, the forward end of the lever is lifted so far that its eye comes out of engagement with the square on the spindle, which is then free to rotate. Should the handle not be returned to this position, the lever engages the spindle M by its square, and no gas can be supplied, since this spindle is driven by the gas passing through the meter, and if its rotation be stopped, the supply of gas is stopped also.

From this construction and arrangement of meter, it follows that, upon the insertion of a coin and the rotation of the handle, the wheel H and its recess are displaced through a determined angle, and the eyes in the levers are lifted out of engagement with the squares on the spindle M, so that the gas is free to flow through the meter. With the flow of the gas, the counting-wheels are compelled to rotate; and thereby the wheel H is also compelled to rotate by its frictional contact, but in the opposite direction to that in which it was moved by the handle. After the determined quantity of gas has passed the meter, the recess O comes under the stop on the lever P, which consequently falls, and engages its eye with the spindle M, stopping the further flow of gas.

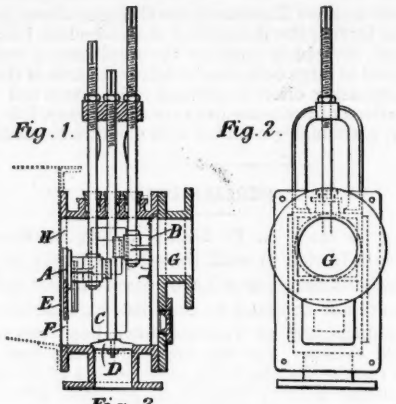
Several coins may be inserted one after another, a turn of the handle being taken for each coin before the insertion of another; and the full value of the coins inserted will be delivered in gas before the supply is stopped. The number of coins will be determined by the gearing F, G, H, as will be obvious.

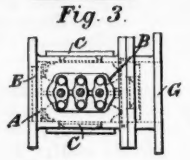
Valves for Hydraulic Mains, Washers, &c.—Cripps, F. S., of Sutton. No. 906; Jan. 16, 1893.

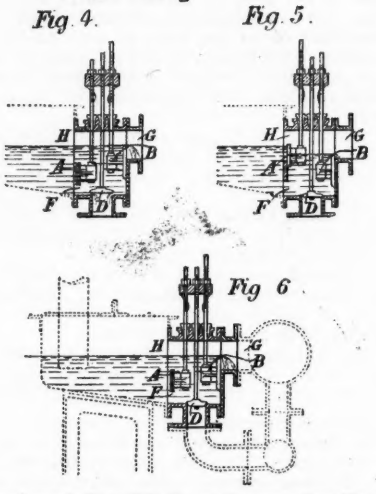
This valve consists "of such parts, and is of such construction, as will admit of drawing off or passing away the gas, tar, ammoniacal liquor, or other liquids or gases, either separately or together, at one time or at different times, as may be desired by the operator, from hydraulic mains, washers, and other apparatus commonly in use in gas-works."

Figs. 1, 2, and 3 show the valve as a rectangular box, on two opposite sides of which are adjustable slides and openings A and B, and on the other two sides are handholes C, with lids for affording access for cleaning, repairs, &c. On the bottom of the box is an ordinary disc or mitre valve D, which can be raised for flushing out the hydraulic main from its lowest level, when required; or it can be partly open, so as to admit of a constant outflow of thick tar at the low level.

As regards the two slides, A and B, on the two opposite faces of the valve, the valve A, which is next to the hydraulic main, has but a small range—working up and down a bridgepiece or bar E across the front. This bridgepiece extends from a little below the lowest overflow level to within a few inches of the bottom of the hydraulic main; an opening F being provided at the foot, to admit of the tar passing direct into the valve. The slide can be raised above the top of the bridge, so as to prevent the liquor passing over that way, as in fig. 1. The slide A working on the bridge face is called the "bridge-slide," to distinguish







it from the seal-regulating slide B, on the opposite side of the valve, and which is termed the "regulating-slide." The slide B is for regulating the seal of the dip-pipes in the hydraulic main, or the overflow-level. The higher this slide, the greater is the seal, and *vice versâ*. This slide also controls the gas-passage G, which, when required, can be closed entirely, and so prevent any gas passing. But when working the gas passes in from the hydraulic main by the opening in the front H, above the bridge-slide A, and then out by the opening G, above the regulating-slide B immediately opposite. When the regulating-slide B is quite closed, the interior of the valve can be opened and attended to without gas escaping.

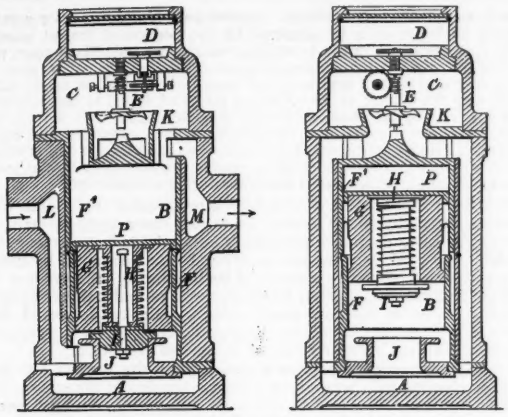
The valve is designed for working in either of the following ways, indicated by figs. 4, 5, and 6: (1) Running the light liquor away at a high level and the tar at a low level simultaneously, as in fig. 4, by slightly opening the flush-disc D at the bottom, but not enough to unseal the dip-pipes. The bridge-slide A must be fully lowered, and the regulating-slide B adjusted, to give the required seal on the dip-pipes. The gas, of course, passes right through H and G at the top without obstruction. (2) The tar can be drawn off constantly, as in fig. 5, by the weight of the greater head of liquor in the hydraulic main forcing it in the opening F at the foot (below the bridge), and up inside the body of the valve, and away over the overflow or regulating-slide B. In this case, the liquor remains in the hydraulic main, and drives the tar out before it. The tar-disc D at the foot is, of course, closed; and the bridge-slide A is kept well up. Or, if found more convenient, the bridge-slide A can be lowered to within ½ inch or so of the overflow-level, so that a small quantity of light liquor is always passing away at the top. The gas flows right through H and G without obstruction. (3) The liquor can be run away at the top, as in fig. 6, by lowering the bridge-slide A fully; the seal being regulated by adjusting the regulating-slide B. In this case, the tar would be flushed out periodically from the bottom by opening the tar-disc D. In the ordinary way, the gas would pass right through H and G, even while flushing out; but, if desirable, the gas can be cut off by closing the regulating-valve B entirely.

Water-Meters.—Mills, B. J. B.; communicated from H. Rostagnat, of Lyons, France. No. 965; Jan. 16, 1893.

This meter is of the class in which all the liquid to be measured passes a reaction wheel, screw, or turbine, the number of turns of which measures the quantity of liquid delivered; and the invention consists in rendering constant the speed of the liquid in the interior of the wheel, whatever may be the variations in the delivery or in the pressure of the incoming liquid.

The engraving shows two vertical sections of the apparatus at right angles to each other.

The cylindrical case of the meter is constructed in three parts, forming four superposed compartments. The upper compartment D (closed



by a sheet of glass) contains the counting apparatus, which may be of any desired system. The wheel, turbine, or screw E, is mounted in the third compartment C, within a circular envelope K, whose lower part communicates freely with the lower compartment A, by means of channels. The wheel transmits its motion to the counting apparatus by an arrangement of endless screws, which give motion to a vertical shaft passing through the bottom of the compartment D, through a stuffing-box. The compartment B is divided into two parts by a piston P, moving without friction in the interior of the cylindrical envelopes F F^1. The weight of this piston is made equivalent to a column of liquid of a certain height; but its friction need not be taken into account, as the tightness is obtained by a flexible sleeve of caoutchouc G, secured at one end to the envelope F, and at the other to the piston.

The liquid to be measured enters by the passage L, which opens below the piston P. The outlet is by the passage M, which communicates both with the space above the piston and with the compartment C, by means of openings arranged outside the envelope K of the turbine. To the piston P is suspended, by a spring H, a valve I, which closes the opening J, and causes the space below the piston to communicate with the compartment A and with the space below the turbine. This valve is pressed to its seat by the pressure of the liquid entering at L, diminished by the pressure which may exist below this valve, whose seat is of a diameter greater than the opening.

The following is an explanation of the working of the apparatus: The liquid, arriving by the passage L, raises the piston, stretching the spring H; but the valve I remains upon its seat until, by the spring being sufficiently stretched (or in case of the insufficiency of the spring, by the piston itself coming against the head of the rod), it is raised from its seat. Then, by the action of the spring, it is placed just below the piston, which has become raised to a greater or less extent. The liquid then enters the compartment A; and is delivered by the channels to the turbine, which it passes, and then escapes by the openings and the outlet-passage M. But as the turbine delivers more liquid than the entrance passage can supply, the piston again descends by the action of its weight, and again places the valve I on its seat. The turbine then ceases to be supplied; the pressure is re-established below the piston, which again rises, and the same effects are repeated.

Gas-Engines.—Dawson, H. T., of Kensington. No. 1070; Jan. 17, 1893.

This invention relates to constructional details of gas-engines, such as: (1) Means for obtaining an efficient heating of the igniting surface, by drawing a blast from an enclosed crank-chamber, provided with inlet and outlet valves, to urge the flame of a burner. (2) The application of an elastic hand-pump in combination with a Bunsen burner and an ignition capsule. (3) The combination of an igniting capsule, a Bunsen burner having a semi-annular mouth, and appliances for supplying a forced blast of air to the burner. (4) Means for regulating the supply of gas, by a governor having an eccentric or cam mounted on a disc or wheel on a rotating shaft, and acting from time to time to open the gas-valve; the eccentric or cam being attached to a weight and controlled by a spring, so that, the greater the speed of rotation, the less the action to open the gas-valve. (5) A lubricator, containing a pump connected with the combustion chamber of the engine, and operated by the variations of pressure therein; the pump delivering oil from a reservoir, whence it is led to the part requiring lubrication. (6) A lubricator, in which a pump discharges oil on to an inclined and adjustable surface, from the edge of which the oil drips, and a funnel receiving a portion of this oil leads it away for use. (7) Means for raising oil or lubricating matter into the crank-bearing, by a curved or inclined tube or duct, dipping intermittently as the crank travels round into the lubricant contained in a receptacle beneath the crank. (8) Means for collecting compressed gases during the working of the engine, and for applying them to start the engine. (9) Storing the air or gas under pressure by means of a stop-valve with a taper valve-seat and grooved valve touching the seat around a narrow circle; the valve being forced into contact with its seat by a hand-wheel, with a hollow threaded boss screwing on to a corresponding thread upon the head of the gland.

Gas-Generators Connected with Steam-Boilers.—Bemelmans, L., of Brussels. No. 1290; Jan. 20, 1893.

This invention relates to the class of producers in which jets of steam induce a current of air into the ash-pit. The principal object aimed at is to permit the use of any kind of coal—"clean or dirty, fine or lumpy, bituminous or dry; and to produce a richer gas, more even in composition and under higher pressure than is usual." To realize these objects, the height of fuel is increased; and the several zones of combustion, of reduction, and distillation are perfectly distinct. Steam is injected above the reduction zone, which thus remains hotter, but without lowering the temperature below 1200° C.—that is to say, at such a heat that only carbon monoxide is produced; thus enriching the gas by what is usually represented by the carbon dioxide. At the same time, the coal is mechanically stirred, in horizontal planes, or the sides of the fire-place vibrated, so that the formation of holes in the fire is prevented, and "a richer and more even gas is obtained, as the different zones of fuel are never mixed by stirring."

Gas-Engines.—Dixon, C. W., of Birmingham. No. 2110; Jan. 31, 1893.

This invention has reference to gas-engines working on the "Otto cycle;" and it has for its object to prevent the "pounding" which occurs, especially when the engines work at high speeds. This pounding is produced by the nearly alternate striking of the opposite sides of the bearings of the cross-head pin, crank-pin, and crank-shaft upon these parts.

In addition to the ordinary cylinder, there is a second or supplementary cylinder in "tandem"—that is, in line with the ordinary cylinder. The second cylinder has a piston fixed to the prolongation of the piston-rod of the ordinary cylinder, and passing through a stuffing-box, at the back end or bottom of the ordinary cylinder. The gearing of the second cylinder is so arranged that when, by the advance motion of the ordinary piston, a mixture of gas and air is being drawn into the ordinary cylinder, the piston of the second cylinder is being urged forward by the detonation which has taken place in it. By thus crossing as it were the action of the two cylinders, the pressure and percussion, which in the case of a single cylinder take place alternately on opposite sides of the parts referred to, occur only on one side; the outward motion of the piston-rod being effected by the second cylinder, instead of by the momentum of the fly-wheel, as in the case of a single cylinder. It is claimed that, in this way, pounding is wholly or in great part prevented.

APPLICATIONS FOR LETTERS PATENT.

23,292.—Galley, J. G., "Meters for measuring water or other fluids." Dec. 4.

23,302.—Holborow, F. H., and Noakes, T., "Automatically intercepting the supply of fluids to pipes or passages on the latter bursting." Dec. 4.

23,305.—Holt, H. P., "Gas motor cars." Dec. 4.

23,379.—Wattles, C. B., "Gas-engines." Dec. 5.

23,433.—Herring, W. R., "Manufacturing oil gas." Dec. 5.

23,445.—Ross, J., "Incandescent gas-lamps." Dec 6.

23,449.—Wallwork, R., "Automatically regulating the supply of gas to stoves and burners; also gas-stoves, in combination or otherwise." Dec. 6.

23,471.—Walker, C. C., "Lids of gas-retorts or the like." Dec. 6.

23,497.—Holt, H. P., "Driving gear for gas motor cars." Dec. 6.

23,609.—Hartley, J. W., and Kerr, J., "Gas-engines." Dec. 8.

23,644.—Hayes, E., "Separating from air or gas light particles of solid matter floating therein." Dec. 8.

23,661.—Pattison, C. A., "Prevention of burst water-pipes." Dec. 8.

23,732.—Robertson, G. M., "Flueless gas heating and cooking stoves." Dec. 8.

23,735.—Sintz, C., "Gas and other explosive engines." Dec. 8.

The Oldham Electric Light Works.—It is expected that the Oldham Corporation will be prepared to supply electricity for lighting purposes from their works about the middle of January. The plant will be capable of serving at one time 3000 lamps of 8-candle power; but there is ample room in the buildings for additional machinery. It is understood that the supply is at present merely intended for private lighting; and that the charge is to be 6d. per unit, with a minimum of 10s. per quarter for the first twenty units or less which may be consumed.

Electric Lighting for Wolverhampton.—The Lighting Committee of the Wolverhampton Town Council presented a report to that body on Monday last week on the subject of the electric lighting scheme for the town. Originally a tender by the Electrical Construction Corporation to lay down the plant for a sum of £28,772 was submitted for approval; but since the appointment of Mr. F. H. Lewis as Electrical Engineer to the Corporation, the scheme has been revised with a view to sub-dividing the contract. The Committee now stated that the total amount of the new tenders, *plus* £1320 estimated for the arc lamps, was £18,762, as against £28,772 in the original estimate. Other items of necessary expenditure would reach £4020; and the total amount of capital expenditure for which a loan was sought would be as follows: Plant, £17,442; arc lamps, &c., £1320; other capital items, £4020; cost of buildings and contingencies, £7228—making a total of £30,011. The report was adopted, as well as a recommendation that application should be made to the Local Government Board for sanction to a loan of £30,000.

The Chairman of the Bradford Corporation Gas Committee and Oxy-Oil Gas.—In moving the adoption of the minutes of the Gas and Electricity Supply Committee at the meeting of the Bradford Town Council last Tuesday, the Chairman (Alderman Moulson) stated that he and the Deputy-Chairman had visited Huddersfield to inspect the gas and electricity works in that town. The Huddersfield Corporation had begun to make oxy-oil gas. He had seen the flames produced by coal gas and oxy-oil gas separately, and by the two together. The coal gas was only equal to about half the power of Bradford gas; but, as soon as it was mixed with oxy-oil gas, the light was doubled. The light from oxy-oil gas alone was, he should think, five times as large. If this new illuminant became more general, there would be a great transformation in methods of lighting. Experiments were still going on; and the Committee did not think it desirable that they should be in a hurry to do anything in the matter at present. The Huddersfield Corporation had recently spent about £9000 in works which they contemplated would save them a large sum yearly. The electricity works were on a larger scale than those at Bradford, and had been built upon a site better suited for such a purpose. The minutes were adopted.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Dr. Thorne and the Peebles Oil-Gas Process.

SIR,—As might naturally be expected from my personal connection with the development of the production of illuminating gas from mineral oil, I read with deep interest Dr. Thorne's paper on the practical working of the oxy-oil gas process at the Huddersfield Gas-Works, and the discussion thereon, which appeared in your issue for the 28th ult. The interest with which I read the paper was intensified by the knowledge that those interested in the operations at Huddersfield had visited this district and inspected the Peebles oil-gas process at work, and also from my having been told by parties who had visited Huddersfield that the process there in operation for the decomposition of the oil into gas appeared to them to be wonderfully similar in principle to the Peebles process. The description of the method of cracking up the oil at Huddersfield given in Dr. Thorne's paper to my mind fully ustifies this expression of opinion by my informants.

In a letter which appears in your issue of last week, Dr. Thorne clearly defines his attitude towards the Peebles process; and he commences to do so by summarizing roughly what he believes to have been the knowledge and experience of gas engineers in oil-gas making prior to the advent of the Peebles process. Generally, I agree with Dr. Thorne as to prior knowledge on the subject; although on some minor points I might be slightly at issue with him. These, however, are not sufficiently important to call for remark at present.

Dr. Thorne says, in his fifth item of common knowledge, that it was known that heavy oil gases varied in luminosity from 50 to 75 candles; the latter power only having been obtained with comparatively low yields. With this statement I perfectly agree. But if such was the case previous to the advent of the Peebles process, how, I ask Dr. Thorne, is it that they are able, at Huddersfield, to obtain such large volumes of heavy oil gas from a given quantity of oil? What is the novel method by which they attain the increased yield over what had been previously obtained.

Dr. Thorne states, about half-way down the first column of p. 983 of your issue for the 28th ult., that "the actual illuminating power of the oxy-oil gas depends, of course, on the oil or other material from which it is made, on the temperature at which that oil is cracked, and on whether the oil is only once run through the retorts, or whether the residuals are further used up by repeated re-cracking." Again, at the bottom of the second column of the same page, he says: "The best results are obtained by keeping a fairly large stream of oil flowing into the upper retorts, and re-cracking the considerable proportion of residual then obtained." So that it would appear that the improved yields—the best yields—of heavy oil gas are obtained by purposely running into the retort a stream of oil greatly in excess of what the retort can decompose; condensing this undecomposed portion out of the gas; and repeating the cracking-up operation on the same lines till the whole is split up into gas and coke. Well, both Mr. Bell and myself, and the many gentlemen interested in the production of gas from oil who have seen the Peebles process in operation, have been under the impression that that very method of cracking up the oil constituted one of the most important parts of the Peebles process.

It is true that the residuals unavoidably produced when cracking up oils at high temperatures have been cracked (or rather I should say attempts have been made to crack them) on the same lines as with the original oil; but in no case has such a process proved practically workable, owing to the choking up of the apparatus with soot and pitch. I am quite aware that Dr. Thorne will be able to refer me to descriptions of such process; but, so far as I am aware, he will be unable to refer to any practical process, prior to the advent of the Peebles process, where the oils were subjected to repeated crackings at a low temperature by purposely running the oil into the retort in a fairly large stream, so that the major part of it will leave the retort ungasified, or in what, for obvious reasons, are called by him residuals, but which are in reality as much a mineral oil as the oil from which they were obtained.

Like Dr. Thorne, I consider that it is not necessary, nor yet desirable, to pick holes in other processes in defending that in which I am interested; and I have no wish to dispute the value of the use of oxygen in conjunction with the process in use at Huddersfield. But I maintain that, in so far as the method of decomposing the oil for the production of oil gas is concerned, the process as conducted at Huddersfield and the Peebles process are substantially identical.

When Dr. Thorne comes to deal with the Peebles process (*ante*, p. 1039), he takes no notice of that fractional mode of decomposing or cracking up of the oils; but, after passing a high encomium upon your humble servant, he goes on to say that the process is one "in which (*a*) all the hydrocarbons easily condensable, or easily soluble in petroleum, are carefully removed from the gas, (*b*) a large proportion—about 30 per cent.—of the carbon in the oil is left in the retort, and consequently wasted as far as the oil gas is concerned, and (*c*) a large yield of oil gas is obtained per ton of oil cracked; and yet the oil gas produced is said to be far higher in illuminating power than, as far as my own knowledge goes, has ever before been attained with even an approximately stable oil gas." From the remarks which then follow, it is evident that the Doctor wishes to convey the impression that the washing of the oil gas with oil and the deposit of carbon in the retort were conditions which must necessarily render the results said to be obtained impossible. No doubt, if what he says about the process were true, he would have good grounds for his opinion.

With regard, however, to the washing of the oil gas with oil, here is what the specification of the patent for the Peebles process says (p. 5, line 56):*

> The purpose to which the oil gas is to be applied has also to be taken into consideration in connection with the washing with oil. When the oil gas is to be used to carburet and give illuminating power to water gas, or to increase the illuminating power of coal gas, hydrocarbon which would condense out of the oil gas if kept separate would be rendered perfectly permanent when diffused through those gases; and therefore for such a purpose less oil washing is required. Indeed, sufficient washing or scrubbing may for such purposes be obtained by the portion of the oil which escapes decomposition in the retort, but which, in a volatilized state, passes off with the gases falling or dropping back through the gases rising from the retort; and in that case it is not necessary to pass the crude mineral oil through the washer at all—it being supplied direct to the retorts by a separate supply-pipe connected to the supply-cistern. On the other hand, when the oil gas is to be used for lighting railway carriages, and requires to be stored under considerable pressure, then the washing of the oil gases requires to be more drastic, so as to render the oil gas as free as possible from hydrocarbon which would condense during compression.

* See *ante*, p. 170, col. 1.

The foregoing extract shows how unwarranted and unfair is the statement made by Dr. Thorne. It makes clear that, instead of, as asserted by him, all the hydrocarbon easily soluble in petroleum being carefully removed from the gas, and thereby, as insinuated by him, the oil gas denuded of a large amount of its luminosity, the process of oil washing is carefully adjusted to the removal of only those hydrocarbons that, if left in the gas, would subsequently be deposited during storeage, distribution, or under compression; in short, to overcome a difficulty that had been experienced in the use of oil gas.

Equally unwarranted is the assertion that the carbon left in the retort is consequently wasted, or is any indication of the value of the Peebles process. The Doctor knows as well as I do that the quantity of carbon deposited in the retort is largely dependent upon the constitution of the particular oil being decomposed. The quantity of carbon present in many oils is so large, as in the case of coal tars, cresote oils, blast-furnace oil, crude heavy petroleums, and heavy oils generally, that hitherto by no practical process could they be cracked up economically for the production of gas, owing to the enormous deposits of carbon, soot, and pitch; and the experiments which resulted in the discovery of the Peebles process were undertaken with the object of overcoming the difficulty that had been experienced in cracking up heavy paraffin oils. By the Peebles process, all these heavy products have been successfully cracked up into gas and hard, solid carbon; the carbon left in the retort ranging from about 75 per cent. from tar, down through the various grades of oil to about 25 to 30 per cent. from the crude heavy oil that has been most largely used in the Peebles process. With light petroleum oil, the deposit of carbon left in the retort is much less; and therefore the percentage of carbon left in the retort gives no indication of the value of a process, unless taken in conjunction with the particular oil being gasified. The oil which was used at the time of the trials made by Mr. Linton would yield, by simple distillation alone, 94 to 95 per cent. of oil, and leave in the still from 4 to 5 per cent of coke; and it is quite evident that the destructive distillation or cracking up of such an oil into gaseous products would necessarily involve the deposit of a much larger quantity of carbon in the retorts.

There is no doubt but that the 15 per cent. of oxygen put into the warm oil gas will take up in diffusion, and carry away, volatile hydrocarbons that would otherwise condense and be re-cracked, and leave in the retort a small additional weight of carbon. But, unless the oxygen has some chemical action as well as a physical one, the like functions of taking up in diffusion those volatile hydrocarbons would be performed by adding to the oil gas, while warm, a like or slightly larger percentage of poor coal gas, which is exactly what the specification of the Peebles process says may be done. Even admitting, however, that the percentage of carbon left in the retort did form a basis of comparison between the processes, the Doctor is not in a position to make comparisons on a practical scale, for he admits that the plant at Huddersfield was not sufficient to crack up all the oil into gas and coke—a part of the residuals having to be used as fuel in the steam-boilers.

With regard to the Doctor's doubts about the large yields and high illuminating power of the gas got from a ton of oil by the Peebles process, I have only to remark that the Doctor himself has shown that he has obtained at Huddersfield equally high yields of equally heavy oil gases; and I hope that what I have said will show that these results are due, in the main, to the fact that the process of cracking up the oil at Huddersfield is similar to that of the Peebles process.

It is very much to be regretted that, in order to support his own experience in the manufacture of oil gas, and the results which he has obtained at Huddersfield and elsewhere, Dr. Thorne should have thought it necessary to throw doubts upon the published figures of the results obtained by others regarding the enrichment value of the oil gas produced by the Peebles process, and particularly upon the figures that were given in Mr. Linton's report to the Edinburgh and Leith Gas Commissioners.

I have already shown how unwarranted were certain of the grounds on which Dr. Thorne has based his doubts. The only point now remaining is the enrichment value of the oil gas. The Doctor admits himself that the enrichment value of oil gas depends on a number of factors, such as the constitution of the oil from which the oil gas is made, the temperature at which the oil is cracked, or whether the oil is distilled at once or by repeated re-crackings. But it would appear that he is of opinion that, however the gas is made, or from whatever quality of oil, it would be impossible to produce an oil gas which, without being commingled with oxygen, would give enrichment results such as those which are given in Mr. Linton's report.

Now, it would be quite easy for me to quote evidence from the managers of the now considerable number of works using the Peebles oil-gas process of enrichment, in confirmation of Mr. Linton's statements. I prefer, however, to call Dr. Thorne's attention to the independent evidence contained in a report by Mr. R. R. Tatlock, F.R.S.E., Public Analyst and Gas Examiner for the City of Glasgow, on the possible enrichment value of oil gas, uncommingled with oxygen, and which appears on p. 689 of the JOURNAL for the 18th of April last. Mr. Tatlock therein states that, by mixing one part of oil gas having an illuminating power of 75·06 candles with six parts of Glasgow gas of 20·04-candle power, he got a mixed gas having an illuminating power of 39·30 candles, and that the enriching power of the oil gas in this case was, therefore, equal to 154·86 candles—an increased illuminating power far in excess of the modest 100-candle enrichment given in Mr. Linton's report. I may remark, however, that the better way to assess the value of an oil-gas enrichment process is to ascertain,

not the enrichment obtained from a given volume of the gas, but the enrichment obtained from a gallon or from a ton of oil cracked.

Dr. Thorne may be entitled to rely more on his own figures than on those of other people; but I feel sure that, in reflecting upon the statement of the results obtained by Mr. Linton in the way he has done, he will not have strengthened the value of his own figures in the eyes of others.

W. YOUNG.

Peebles, Dec. 12, 1893.

Mr. Alex. M'I. Cleland and The Gas Institute Index.

SIR,—The aphorism which forms the opening of Mr. Cleland's letter in your last number is an appropriate introduction to one of the bitterest personal attacks that have ever appeared in the JOURNAL, and it may account for the little eccentricities that are in evidence throughout his communications, of which the claim that the "general tenor of his article was approved" is an example. Only one of your correspondents refers to his attack on The Gas Institute index, which is the subject of the present discussion, and that with marked neutrality. Possibly the quotation from my letter (of which no copy has been kept) may be similarly misrepresented; but in any case it is not reasonable to claim that I support his action at one time, and get into a rage over it at another. It may also serve to explain his assertion that "he passes the purely personal parts of my letter in silence," which is entirely out of place at the end of a letter consisting of a rejoinder to every personal point raised, taken *seriatim*.

There is nothing in my letter which exceeds the fair bounds of discussion; and Mr. Cleland's "ostrich-like" attempt to dispose of its principal features, as the unreasonable utterances of an angry person, will not conceal the fact that he evades them. He also seeks to cover his retreat by raising a cloud of additional matter; but I decline to be drawn off the scent. His action in 1889, or the sale of a few books to him in 1890, has nothing to do with the points under discussion. The one does not give him any knowledge of the Institute affairs in 1893; nor does the other affect my contention that the "Transactions" are a private work. The Council could refuse to sell him a copy at any time. I would gratefully accept help from any source if offered in a genuine spirit; but I need scarcely add that assistance prompted by the motives indicated in Mr. Cleland's letter would be refused without thanks.

Mr. Cleland seems to think that I was unnecessarily personal in my reply. I endeavoured to avoid being offensive; and, at any rate, I have not been guilty of such a breach of trust as that involved in the publication of ordinary correspondence and private business matters without the consent of the party concerned. Mr. Cleland is an entire stranger to me. I had quite forgotten the little business matter he refers to, and was not till this week aware that he had ever been a member of The Gas Institute.

N. H. HUMPHRYS.

Salisbury, Dec. 15, 1893.

The Meaning of "Stove."

SIR,—Some time ago I had a small "tilt" with you on the "stove" question. The latter word is coming now so often in the JOURNAL, that one might parody Shakespeare and say: "All the world's a stove." No writer I know is more choice in language and expressions than yourself; and yet, when I look at my old English Dictionary, which I used at school forty years ago, I find: "Stove, *n.*, a heated chamber; *v.*, to heat in a chamber." If the English Dictionary is an exponent of the English language, I fail to see your reason for calling a burner, a water-boiler, or a griller a "stove." As a matter of fact, the use (or rather the misuse) of this word is an expensive nuisance, which leads to constant mistakes in sending wrong catalogues; and I trust you will see your way to set an example in this as you do in other forms of correct language.

THOS. FLETCHER.

Warrington, Dec. 14, 1893.

An "Improved" Invariable Water-Line Gas-Meter.

SIR,—In reply to the letter of Mr. W. Cowan which appeared in the JOURNAL for the 12th inst., relative to our invariable water-line meter, we ask you to be good enough to insert the following observations in your next issue.

Mr. Cowan is in error in seeing in our appliance an imitation of his "syphon overflow" meter. If our object had been to ensure the exact levelling of meters, without either over or under watering, our invention would not have presented any interest; the problem having been solved by Mr. Cowan's "syphon overflow." But we placed ourselves at quite a different standpoint. We were specially occupied with remedying certain inconveniences connected with drum meters giving unvarying measurement—viz., (1) Obviating syphoning during watering, even when this is done rapidly; (2) Preventing overrunning of the syphon by redundant water, arising, for example, from the return of water of condensation, and all the troubles resulting therefrom, such as jumping lights and extinctions. This double object has been attained in a very simple way, which does not complicate the construction of meters, by establishing a communication between the overflow-box and the case of the meter; thereby allowing the excess of water to lodge in the hydraulic box, even while the meter is at work—that is to say, with the outflow orifice closed by the plug.

As fitted up, our meters cannot syphon during the operation of watering; and while in use, they are capable of bearing a considerable overcharge of water without the least interference with their rigorously exact measurement, or with the perfectly regular flow of gas.

J. MALDANT, DUPOY, ET CIE.

Paris, Dec. 15, 1893.

The Use of Angus Smith's Solution for Water-Pipes.

SIR,—Referring to your report of the case of *Green and Hendon v. Chelsea Water-Works Company*, Sir F. Bramwell says: "I have never been consulted professionally in regard to the actual construction of water-works." And again: "In the present day . . . Dr. Angus Smith's solution would be specified. This composition was not known when the pipe in question was laid." From the evidence it would seem that the pipe was laid about 1860. The following extract from Dr. A. Smith's well-known specification, dated Oct. 19, 1848, seems to point to an inaccuracy in Sir F. Bramwell's evidence which requires explanation, unless his own evidence furnishes it: "This invention consists of the application and preparation of coal tar to the interior surfaces of water-pipes, so as to obtain a coating to such surfaces."

M.INST.C.E.

Dec. 13, 1893.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Monday, Dec. 11.

(*Before the* LORD CHIEF JUSTICE *and Mr. Justice* COLLINS.)

In the Matter of the Lighting and Paving Board of Eckington.

In this case, application was made for an order *nisi*, by way of information in the nature of a *quo warranto*, directed to Frederick Barber, calling upon him to show cause why he should continue to exercise the office of Inspector under the Watching and Lighting Act, 1833 (3 & 4 Wm. IV., c. 90), for the parish of Eckington.

Mr. GLENN, in moving for a rule, stated the facts of the case, as follows: The parish of Eckington is divided into three parts—first, Eckington, containing the village of that name, which is the most populous; second, Renishaw, which contains only about 70 ratepayers; and, third, a district which is practically uninhabited. Some years ago, the village of Eckington adopted the Watching and Lighting Act, which was administered by Commissioners; but nothing was done with respect to Renishaw till recently, when a few lamps were erected in that district. The Renishaw people, however, did not want the lamps; and when they were called upon to pay for them by means of a rate, they declined to do so, as they had never adopted the Act. When the ratepayers were proceeded against for the recovery of the rate, the Magistrates held that it could not be enforced against them. Thereupon certain ratepayers of the village of Eckington signed a requisition for calling a meeting to rescind the resolution adopting the Act for the village, and a second requisition for a meeting with the object of adopting the Act for the whole district. Both meetings were held on the same evening—the first at seven o'clock, and the second at a quarter-past seven. At the first meeting, which consisted only of inhabitants of Eckington, Mr. Frederick Barber was elected Chairman; and the resolution rescinding the adoption of the Act was passed. Then the second meeting was held, at which inhabitants of Renishaw were present, and protested against the adoption of the Act for their district. But they were swamped by numbers; and the Act was adopted, and Commissioners appointed to carry it out—Mr. Barber being appointed Inspector. The learned Counsel submitted that the whole of the proceedings were illegal. In the first place, the rescinding of a previous resolution was not done in the way provided by the Act; secondly, Mr. Barber, being Chairman of the Eckington Gas Company, who were interested in the adoption of the Act over as wide a district as possible, was disqualified from acting as Chairman of the meeting; in the third place, there was no legally-elected Chairman at all for the second meeting—Mr. Barber continuing to preside without a new election. As the meetings were two separate and distinct ones, a Chairman ought to have been elected to preside over each.

A rule was granted.

(*Before Mr. Justice* MATHEW *and a Special Jury.*)

Jenkins v. The Hastings and St. Leonards Gas Company.

The hearing of this case, the opening proceedings in which were reported last week (p. 1089), was resumed to-day.

John Beaumont, a young man in the employment of the plaintiff, was the first witness called. He said he was in the paint-shop on the morning of the fire. There was a closed stove in the room; but it had not been used for three months before the fire.

Cross-examined: The lead lights were made in the paint-room; and for this purpose a small stove was employed on the bench. It stood on a tray.

Henry Howard, a painters' foreman employed for 13 years by the plaintiff, said the stove in the paint-room was an old-fashioned tinker's stove; and it had not been used since Oct. 28, 1892. There was no fire or light used in the painters' shop on the day of the fire.

Cross-examined: The use of the stove was given up because he believed Mr. Jenkins considered it was dangerous, and might interfere with the insurance.

Alfred Henry Winser, a plumber in the Hastings Volunteer Fire Brigade, said he arrived at the scene of the fire with the hose reel about 25 minutes to three. He saw a big hole in the flooring above the meter. After ineffectually attempting to put out the fire, he mounted a ladder, and looked through a window of the paint-shop, which was full of smoke; but there was no fire in it then. It was past three o'clock before the flames reached the paint-shop.

John Austin, a plumber employed by Mr. Jenkins, who fitted the meter to the connecting-pipe, produced a piece of pipe similar to the one destroyed.

George Hine, a member of the Fire Brigade, said when he arrived at the premises he saw a red-hot hole from 3 to 4 feet, well alight, burning rapidly upwards. On going to the room above, he noticed the only fire was that which came straight up from the meter.

Cross-examined: He recollected a fire occurring at these works about three years previously, on a Saturday afternoon. It was then in the blacksmiths' shop in the basement.

Mr. *G. T. Jenkins*, son of the plaintiff, said he gave orders for the stove in the paint-shop not to be used, as it was not endorsed on the insurance policy; and it was not made use of on the day of the fire. He was called to the works after the fire broke out, and saw the flame ascending from the meter.

Cross-examined: The flames burst into the paint-room about half-past three. A fire occurred in the basement in 1889; shortly after the works were started.

This closed the evidence on behalf of the plaintiff.

Mr. JELF, in opening the defendants' case, said it was a matter of great importance to all gas companies that it should be plainly understood that it was not by surmise or inference, but by plain proof of the negligence of their servants alone that companies could be held liable for damages occasioned by fire. He did not make any point of the fact that the services rendered in clearing the pipe were gratuitous; and he was ready to admit that the men were bound to perform their duty with due skill. The plaintiff had to prove that the fire was caused by the negligence of the defendants' servants; and it would be a hard thing for shareholders in gas companies if any such principle as the following were allowed to prevail: "We have had a tremendous fire. Your men were on the premises. We cannot put our finger on anything to account for the fire; and therefore you must pay for the damage caused." The plaintiff, before obtaining a verdict, was bound to establish, to the satisfaction of a jury, some definite act of negligence on the part of the defendants' workmen; and this he had failed to do. His (Mr. Jelf's) theory was that the fire occurred in the paint-room; but it was not necessary for him to prove this, as the onus of proof lay on the plaintiff, and not on the defendants.

Mr. *W. Hewlett*, foreman gas-fitter in the service of the defendants, said he went with a man named Unstead to the plaintiff's works about 20 minutes past one on the day of the fire, to clear the pipes. The meter was some distance from the ground; and, in order to reach it, he stood upon a box placed on some planks. There was no ladder or steps there. He disconnected the inlet, and lifted it, in order to ascertain whether the service was blocked; and, being satisfied that the service required cleansing, he immediately turned the main tap off. As it was necessary to shift the meter in order to get at the inlet, he unscrewed the outlet about two threads. The force-pump was then applied to the inlet-pipe. He afterwards re-connected the inlet-pipe, and screwed up the outlet tight. He then sent Unstead upstairs to ask the man to light up, in order to see how the gas was. Unstead came down, and said it was all right. Witness smelt to ascertain if the gas was escaping; and, being satisfied that there was none leaking, he applied a light both to the inlet and outlet. He was perfectly convinced there was no light round the joints. He also blew the joints twice; so that if there had been a light it must have gone out. He was sure that the work had been done properly. Had there been any ignition, he must have seen it. After testing the joint, Stammers, the foreman, said: "How have you left the tap?" Witness replied: "Full on." Stammers answered: "All right;" and he then added: "There is a strong smell of gas upstairs." Witness replied: "I dare say there is. But look at the joints between your boards; they are very wide, and the gas would immediately ascend." As witness was moving away, Stammers asked what size the meter was; and witness returned and looked at it, and informed him that it was a 20-light meter. He then left.

Cross-examined: The model of the meter and outlet-pipe produced in Court showed a longer joint on the outlet by $\frac{5}{8}$ inch than the one upon the works. The meter was shifted in order to use the force-pump. There was no smell of gas when he tried the joints. He always tested them with a match. There might be an escape from an imperfection in the joint, or from the union not being screwed down tightly. If there was an escape, and it became lighted, there was a possibility of the light going out; but even if it did not, nothing would happen. He had known of fires occurring to buildings, but not through an escape of gas.

How do you think this fire occurred?—One often reads of fires where the gas-pipe becomes melted; but it is a difficult matter to trace the cause. My opinion is that it did not come from the gas-joint proper, but from some other cause.

From what other cause? Shall we say a will-o'-the-wisp, to begin with?—I should not attribute it to the leakage of gas. I should say someone had caused the fire by carelessness about the spot.

Where?—It may proceed from upstairs.

May I take it that you have not the remotest idea, if it did not occur from the meter, how it occurred?

No answer being given to this question, his Lordship remarked that silence gave consent.

Charles Unstead, assistant fitter in the employ of the defendants, who accompanied the last witness to the plaintiff's works, gave corroborative evidence.

Cross-examined: He had been in the service of the Company for four years; but previously he had no knowledge of gas work. He had not the slightest idea as to how the fire occurred. He had not tried to form any opinion. He had talked the matter over with Mr. Hewlett; but he had not been able to arrive at any theory with regard to it.

Re-examined; His duty consisted in merely charging the pump.

Mr. *C. E. Botley*, Assoc.M.Inst.C.E., the Engineer and Manager of the defendant Company, said he had made experiments with a view to testing the effect of a flame at the junction of the meter outlet union. His attention was directed to seeing whether it was possible, with a small leakage from the outlet, to melt the solder, and so allow more gas to escape. He had also directed his attention to an escape from punctures made in the lead pipe, to see whether it would have a tendency to melt the pipe, and so allow a greater egress of gas, and cause fire. He had further made experiments to melt the solder in the joint, and with this view to create a gas-flame, and so see the effect of the flame upon the surroundings. With the outlet-joint slackened, he obtained a light more than an inch long, which played directly upon the solder. This was alight continuously for some eight hours without any damage whatever being caused. The temperature reached was 200° Fahr.

By Justice MATHEW: During no portion of the eight hours was there a greater escape of gas.

Examination continued: The experiments were made with the view of attacking the weakest part of the pipe; and they were all made with flames of gas which it would have been impossible for anybody at the works to pass by. He produced a pipe upon which he had experimented, which was exposed to a continuous $\frac{3}{4}$-inch flame for two hours and a half; but no impression had been made upon it. If desired, the experiment could be repeated in Court. The melting-point of solder was 360° Fahr.; and the highest point he reached in the eight hours was 200° Fahr. Supposing the outlet-pipe had not been screwed up tightly, it would have been absolutely impossible, even if there had been a light, for the pipe above to have been destroyed in an hour and a half. He had made other experiments similar to those he had mentioned, and with a similar result. With an escape from the joint in question, the pipe above the meter could not have been melted. It would not have been melted even if the pipe had been cut asunder and lighted at the end. Another experiment he had made was with an imperfect washer in the brass union—thus allowing an escape of gas; but even in this case the result was the same.

Cross-examined: He had not investigated the probable cause of the fire. He declined to give any theory as to the cause, as there were so many causes possible.

Tell me what they are?—There is no occasion for me to suggest. There is the question of spontaneous combustion.

Of what?—Of materials.

Will you apply that to the melting of the gas-pipe?—I should have to invent a theory.

Invent your spontaneous combustion theory?—If I suggest a theory, I may lay myself open to ridicule; it is, after all, only a theory.

Mr. JELF objected to this line of cross-examination. He said the witness had come there to speak as to experiments he had made, and was not called upon to invent theories in order to satisfy the power of ridicule of the learned Counsel who was cross-examining.

Justice MATHEW said he understood the witness to say that he had considered the matter, and had formed certain opinions.

Witness said he had not considered the matter, and could offer no opinion except what would be a mere waste of time.

Justice MATHEW: Can you offer any suggestion as to how the fire occurred, except that it came from the meter?

Witness: I say I do not know the premises or the condition of things, as I was not there; and therefore it would be difficult for me to try to make any suggestion. We know that fires do occur from various causes which it is difficult to find out.

Cross-examination continued: The only way in which he conceived the gas-pipe could be melted would be for a sufficient volume of flame coming out of the meter to begin melting the bottom of the pipe; but it could not melt the middle of the pipe, which did not go straight up. Since January last he had had his attention directed to the point of whether an escape which was not visible could cause damage; and he should say that, in his opinion, it would not. In all the experiments he had made, the flame touched the solder. If the pipe was melted, there would be a flame of gas 5 feet in height. In the case of a portion of the solder becoming melted, the flame would go downwards, and not upwards. He would not offer any opinion as to the evidence given by Mr. Wingfield as to a joint melting in 35 minutes. The highest flame he had had in any experiment was $1\frac{1}{4}$ inches; and the lowest, $\frac{3}{4}$ inch.

Re-examined: Even with an imperfect joint, he had not been able to get the solder melted within an hour and a half, without a visible flame which must have been at once detected. He could not suggest any theory as to how the pipe was destroyed within an hour.

Mr. *Vivian B. Lewes*, F.I.C., F.C.S., Professor of Chemistry at the Royal Naval College, Greenwich, and Chief Gas Examiner for the City of London, said he had directed his attention to the study and properties of gas and gas-flames, especially the temperature of flames. He had made some experiments with regard to the effect of a flame at an outlet joint similar to the one in question. The meter in Court, with the fitting attached, was sent to him by the defendants as representing the meter and fitting in use at the Grosvenor Works; and he was requested to make experiments with it to see if the temperature of a flame which a careful workman would not notice could bring about the damage alleged to have been caused by it. The experiment he made was to have the meter carefully connected to a gas-main in the ordinary way. At the T junction he put in a pressure-gauge, so as to ascertain the pressure; and he averaged it at 15-10 ths. Having got this pressure, he loosened the collar at the outlet until he had a flame $\frac{3}{4}$ inch long. He chose this size because at that particular length, as soon as the collar began to warm, the flame had a small luminous tip, and therefore could not be overlooked by any workman, however careless he might be. He kept this flame burning for eight hours. At the end of that time, he carefully took the temperature of the solder immediately above it. He ascertained this by the most delicate means which Science had at her disposal; and he found it to be 280° Fahr. He then obtained some samples of solder, and took the fusing-point. It melted at 360° Fahr.; so that he had a clear 80° before the melting-point would have been reached. The temperature of 280° Fahr. would probably have been reached within 20 minutes of the flame being lighted. After that time, the temperature became constant, simply because the conducting power of the metal would carry the heat into the air. To get the flame he had mentioned, he had to loosen the collar half a turn. Another experiment he made was with the view of trying the effect of the base of the flame in heating. When one had a flame issuing from an orifice, it dispersed its heat upwards. Taking a small flat flame burning downwards from the brass collar, the temperature was 270° Fahr. When a pin-hole was made in the pipe, and the gas lighted, the temperature was a little over 100° Fahr. This reduction was in consequence of the large mass of metal conducting the heat away.

Is it possible for any flame, in the space of an hour, not only to have destroyed the upright piece of pipe, but to have melted away the joint?—I say that any flame which could have escaped the eye of a careful workman could not possibly do the damage mentioned.

Suppose you cut away a piece of the pipe over the outlet, and set fire to the gas would it in course of time melt away the whole pipe?—Yes; but outside the flame it would not be melted more than a quarter of an inch. The lead of which the pipe was made melts at 650° Fahr. If the outlet-joint had been entirely taken off the meter, there would have been a big flame, which would have swelled as it went up; but it would not have melted the bent portion of the pipe—that is to say, the portion immediately over the meter.

Cross-examined: The flame from the outlet would extend a distance

of some 4 or 5 inches. There must have been a very large amount of heat coming from somewhere to melt the pipe. If anyone had gone into the works and taken a marline-spike and smashed the head of the meter, so that there was a flame going up a foot in diameter, it would have done the damage complained of.

If this had been done, would not the men who came in first have seen the flame issuing from the top of the meter?—Certainly.

If it was not done with a marline-spike, inasmuch as the pipe was melted, how do you say it was done?—You have only to create a fire sufficient to melt lead, and it is done; but I will leave the lighting of the fire to you.

What degree of fire would be sufficient?—One to give a temperature of 650° Fahr.

Of what would such a fire be constituted?—You could do it with a brazier of hot coke.

Kept there for how long?—Three minutes.

Do you suggest that this was done?—I am not suggesting that any of these things were done; I am merely giving you the result of some of my experiments.

Cross-examination continued: He had heard Mr. Wingfield state that he obtained the melting of the pipe in 35 minutes; but the conditions under which he must have used the ¾-inch flame were very different from those under which he (witness) had used it. He did not feel sure that Mr. Wingfield's evidence was altogether convincing. If Wingfield were to take the meter fitted as it was at present, and make a flame at one side ¾-inch high, he could not possibly melt the pipe or solder in 35 minutes, nor yet in an hour and 35 minutes.

Re-examined: The experiments he had made were not such as to bring the force of the flame to operate on the solder.

By Justice MATHEW: The flame he used would not have touched the solder, because it was a ¾-inch flame, and the solder would be more than ½-inch above.

Re-examination continued: Assuming the flame to touch the solder, it would be distinctly visible. He could not say for certain how long it would take to melt the solder; but, in all probability, it would not melt it, as the heat would be conducted away. In order to melt the solder at such a junction, it would be necessary to have an even flame playing all round the socket.

This concluded the evidence.

Sir E. CLARKE proceeded to sum up the defendants' case. In doing so, he pointed out that it was not for the Company to suggest any theory as to how the fire occurred, but merely to prove that there had been no negligence on the part of their servants; and this, he submitted, they had done.

Tuesday, Dec. 12.

Sir HENRY JAMES this morning replied upon the whole case, characterizing the action as an absolutely undefended one.

Justice MATHEW, in summing up, said the question the jury had to consider was: How was the fire caused? It was perfectly clear that, a short time before the fire was discovered, two of the defendants' workmen had been employed at the meter, performing an operation which involved the shifting of the meter and the unscrewing of the outlet-pipe, which made a pivot on which the meter turned. This was an operation calculated to put a strain on the pipe, and so to cause an escape of gas—at least, the plaintiff so suggested; while on behalf of the defendants it was urged that, after the operation was over, the meter was replaced, and the outlet screwed up. It was said that the operation was performed in a hurry, as the men were anxious to get away; and there was the singular fact that, although it was usual to try the joint with a light, the men came without matches, and had to obtain them at the works. The jury were asked by the plaintiff to say that the three tests of (1) smell, (2) light, and (3) blowing were not carried out, or, if they were, were done in a hurry, so that a small jet was left which caused the mischief. For the defendants, it was said that the evidence which had been given ought to satisfy the jury that, even if there was a small jet, the flame would not do any harm. The plaintiff said the flame would operate upon the solder, and that when this was melted the flame would feed itself. Upon this point some scientific evidence had been given on behalf of the defendants; and very singular evidence it turned out to be. Wingfield, who had been called on the plaintiff's behalf, said he had been able with a small jet of gas, ¾ inch in length, to melt the solder; and the only criticism made on his evidence was that he had not had a scientific training. But he was an independent witness; and in that respect he was in a very different position from Mr. Botley. The scientific witnesses for the defendants put the matter in the following way: Granted that the men did not do their duty properly, granted that there was a small jet left behind, still that jet, if ignited, could not possibly have caused what happened. It was further said that, if there had been such a jet of flame as would have operated on the solder, the workmen must have seen it. There was the fact that the model supplied by the defendants to Professor Lewes for the purpose of experimenting upon was not identical with the original joint, and it was not so in one remarkable respect—viz., that there was greater space between the top of the flame and the solder. Professor Lewes said he pierced a pipe and obtained a jet ¾-inch long, which did not operate upon the solder; but it turned out that the flame was not in contact with the solder, but ½ inch away. Another remarkable thing was that neither the witnesses nor Counsel for the defendants were able to suggest how the fire happened, unless it was in the way the plaintiff supposed. His Lordship then dealt with the suggestion that the fire occurred in the paint-room, and pointed out that no evidence had been given to support this theory. After referring to the other suggestions made on behalf of the defendants, he left it to the jury to say whether or not there was any evidence to support them. It was for them, as reasonable men, to say whether the fire occurred in the way suggested by the plaintiff, or as was supposed by the defendants. If the question was at all doubtful, the defendants were entitled to a verdict. For the plaintiff to succeed, he must satisfy the jury that the fire occurred through the negligence of the defendants' servants.

The jury, without retiring, gave a verdict in favour of the plaintiff; the amount of damages to be determined on reference.

MISCELLANEOUS NEWS.

METROPOLIS GAS SUPPLY.

The Referees' Notification as to the Candles to be Used in Testing Gas.

The following is the text of the "Notification" which, as stated in the JOURNAL last week, the Metropolitan Gas Referees have lately issued as to the candles to be employed for testing the illuminating power of gas:—

The candles to be used for testing the illuminating power of gas are defined by the Metropolitan Gas Acts as "sperm candles of six to the pound, each burning 120 grains an hour." But whereas candles coming within this definition, but differing in other particulars, differ greatly in the light they give; and whereas a controversy has arisen between the London County Council and the Gas Companies as to the candles which should be used in testing; and whereas the Chief Gas Examiner has disallowed a return of the illuminating power of gas on the ground that "candles of different manufacture, possibly of different illuminating power, from those usually employed in the testing-places, and which had not been prescribed nor certified by the Gas Referees, were employed in the tests against which the Company have appealed;" and whereas the London County Council have called upon the Gas Referees to prescribe and certify the candles to be used in the testing-places; and whereas it is the duty of the Gas Referees (Gaslight and Coke Company Act, 1876, sec. 34) from time to time to prescribe and certify the apparatus and materials in the testing-places for testing the illuminating power of gas, and of the Company to provide such apparatus and materials accordingly; and whereas sperm candles are the material by which the illuminating power of gas is tested; we do therefore hereby prescribe as follows:—

(1) All candles to be used in the testing-places shall be made with the materials hereinafter prescribed, and shall, when made, be examined and certified by the Gas Referees.

(2) The wicks shall be made of three strands of cotton plaited together, each strand consisting of 18 threads. The strands shall be plaited with such closeness that, when the wick is laid upon a rule, and extended by a pull just sufficient to straighten it, the number of plaits in 4 inches shall not exceed 34, nor fall short of 32. Each wick shall be of suitable length, and looped ready for fixing in the mould. After having been bleached in the usual manner and thoroughly washed (see Appendix), the wicks shall be steeped in a liquid made by dissolving one ounce of crystallized boracic acid in a gallon of distilled water, and adding 2 ounces of liquid ammonia. They are then to be gently wrung or pressed till most of the liquid has been removed, and dried at a moderate heat. Twelve inches of a wick thus made and treated shall weigh not more than 6·5, nor less than 6 grains. The weight of the ash remaining after the burning of ten wicks which have not been steeped in boracic acid, or from which the boracic acid has been washed out, shall be not more than 0·025 grain. Wicks made in accordance with this prescription shall be sent to the office of the Gas Referees, by whom they will be examined and certified. The wicks so certified are to be used by the candle-maker in the condition in which they are returned to him.

(3) The spermaceti of which the candles are made shall be genuine spermaceti, extracted in the United Kingdom from crude sperm oil, the product of the sperm whale (*Physeter Macrocephalus*). It shall be so refined as to have a melting-point lying between 112° and 115° Fahr. An account of the method by which the melting-point of the spermaceti is to be determined is given in the Appendix. Since candles made with spermaceti alone are brittle, and the cup which they form in burning has an uneven edge, it is necessary to add a small proportion of beeswax or paraffin to remedy these defects. We therefore prescribe that the best air-bleached beeswax, melting at or about 144° Fahr., and no other material, shall be used for this purpose, and that the proportion of beeswax to spermaceti shall be not less than 3 per cent., nor more than 4½ per cent.

(4) The candles made with the materials above prescribed shall each weigh, as nearly as may be, one-sixth of a pound, and will be found to answer to the following test: Immerse a candle, taper-end downwards, in water of 60° Fahr. with a brass weight of 40 grains attached to the wick by a small piece of thread. When a further weight of 2 grains is laid on the butt end of the candle, it will still float; but with a weight of 4 grains it will sink. As the rate of burning of a candle is affected by the force with which the wick is pulled when it is set in the mould, the strain commonly applied by an experienced maker of candles has been measured, and is found to be about 24 oz. The candles shall be sent to the office of the Gas Referees, by whom samples from each batch will be examined and tested. Each batch of candles shall be accompanied by a specimen of the spermaceti (unmixed with beeswax) which was used in making them. Packets of candles approved by the Gas Referees will be sealed by them, and certified for use in the testing-places.

(5) The candles are to be used by the Gas Examiners as heretofore, in accordance with the half-yearly "Notifications" of the Gas Referees. The results are to be corrected as usual, on the assumption that for small variations the light of a candle varies directly with its consumption; and if any candle in a packet certified by the Gas Referees is found by a Gas Examiner to burn at a rate exceeding 126, or falling short of 114 grains per hour, the testings made with that candle are to be rejected.

APPENDIX.

Method of Determining the Melting-Point of the Spermaceti.

As various methods are used by different refiners of spermaceti for determining the melting-point, which lead to different results, it must be noted that the temperatures here given as the limits within which the melting-point of a sample of refined spermaceti should fall—viz., 112° and 115° Fahr.—have been found by the following method, which is known as the capillary tube method:—

A small portion of the spermaceti is melted by being placed in a short test-tube, the lower end of which is then plunged in hot water.

A glass tube drawn out at one end into a capillary tube about 1 mm. in diameter is dipped, narrow end downwards, into the liquid spermaceti, so that, when the tube is withdrawn, 2 or 3 mm. of its length are filled with spermaceti, which immediately solidifies. The corresponding part of the exterior of the tube is also coated with spermaceti, which must be removed. The narrow part of the tube is then immersed in a large vessel of water of a temperature not exceeding 100° Fahr. The lower end of the tube which contains the spermaceti should be 3 or 4 inches below the surface, and close to the bulb of a thermometer. The upper end of the tube must be above the surface; and the interior of the tube must contain no water. The water is then slowly heated; being at the same time briskly stirred, so that the temperature of the whole mass is as uniform as possible. When the plug of spermaceti in the tube melts, it will be forced up the tube by the pressure of the water. The temperature at the moment when this movement is observed is the melting-point.

Method of Washing Wicks.

As it is found to conduce to the regular burning of candles that the wicks should have been as far as possible cleaned and freed from mineral matters, it is recommended that the candle maker, before steeping the wicks, shall wash them first in distilled water made alkaline with between 1 and 2 per cent. of strong liquid ammonia, then in dilute nitric acid containing about 10 per cent. of strong acid, and then repeatedly in distilled water.

CONTINENTAL UNION GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, 7, Drapers' Gardens, Throgmorton Street, E.C.—Sir JULIAN GOLDSMID, Bart., M.P., in the chair.

The SECRETARY (Mr. F. W. Himing) read the notice convening the meeting, the accounts, and the following report of the Directors:—

The Directors have to inform the proprietors that the concession for lighting the town of Montargis, in France, has been prolonged to the 1st of January, 1935. Reductions in the price of gas have been made from the 1st of January last both to the town and the private consumers. The profits at this station, up to the 30th of June last, have consequently shown a decrease; but the Directors hope that the increased consumption will restore the balance in a not very distant future.

The mains at Montargis have been extended to the outlying hamlet of Chalette, for which a concession has been obtained.

The total increase of gas sold at Messina and Montargis—the two stations belonging exclusively to the Continental Union Gas Company, Limited—is, for the year ending the 30th of June last, 2½ per cent.; the number of consumers on the books of the Company having increased from 2999 to 3249. There has also been a small increase in the number of public lamps supplied with gas.

The total of bad debts incurred and written off the profits amounted to some £30.

The amount spent on capital account at the two stations amounts to £1304, chiefly for new mains, service-pipes, a purifying-shed, &c.

As regards the stations belonging to L'Union des Gaz, the net outlay on capital account during the year under review amounted to £28,435, which sum includes the cost of an additional gasholder at Milan, a new gasholder tank at Alessandria, additional benches of retorts at Milan and Rueil, and additional mains, service-pipes, and public lamps at all the thirteen stations, &c.

The following statistical information relating to the working of L'Union des Gaz stations is given here, as usual: The net increase in the number of consumers for the year ending the 30th of June last was 4739; making a total of 70,775 consumers on the books of L'Union des Gaz. There was also an increase of 408 in the number of public lamps, spread over the whole of the thirteen stations; making a total of 17,234 street-lamps supplied with gas on the 30th of June last. The increase in the total quantity of gas sold amounted to 4¼ per cent., which is satisfactory. The average price of coal shows a decrease of about 2s. per ton; but, on the other hand, the average selling price of coke has decreased exactly 1s. per ton. Tar also shows a decrease of 2s. per ton; ammoniacal liquor remaining practically the same. Bad debts incurred and written off profits amount to £519; being at the rate of about 2d. for every £10 of the gross rental.

The concession for lighting the town of Nimes—the most important of those belonging to L'Union des Gaz in France—which would have expired on the 31st of December, 1906, has been extended until the 31st of December, 1930. To conclude it, the Directors agreed to a reduction in the price of gas, both for the public lamps and the private consumers.

The concession of the Commune of Cornigliano has been extended to the same date as that of Genoa—viz., March, 1924. The Union des Gaz have also obtained a concession for lighting the hamlet of Carrières St. Denis, adjacent to Rueil, near Paris.

The Directors early in the year arranged the renewal of contracts for the supply of Durham coal to the Italian stations, for a period of three years, from the 30th of June last, at favourable prices.

The Union des Gaz accounts show that that Company have placed the further sum of £11,000 to special reserve account, and have declared an increased dividend of 10 frs. per share, carrying forward an undivided balance of £35,998. Your Directors have determined to apply the proportion of this extra dividend, falling to the Continental Union Gas Company, Limited, to writing down the stock purchased in the market, and held by the Company, to its par value of £60,000.

The Directors have further to report that the vacancy caused on the Board by the death of Mr. Backler has been filled by the election of Mr. R. Hesketh Jones, formerly Auditor to the Company. The consequent vacancy in the auditorship has been filled up provisionally, until this general meeting, by the election of Mr. I. A. Crookenden.

After making the usual charges and reserves, the net profits of the Continental Union Gas Company, Limited, for the year amouut to £124,078 13s. 4d. The available sum to the credit of general revenue is £161,996 7s. 11d., out of which the Directors recommend a dividend at the rate of 13 per cent. per annum. The holders of 7 per cent. preference stock participate *pro ratâ* in all ordinary dividends exceeding 10 per cent., and will, therefore, receive 10 per cent. for the year. It is proposed that, after deducting the interim dividend paid in July last of 5 per cent. on the ordinary, and of 3½ per cent. on the preferential stock, the balance of 8 per cent. on the former, and of 6½ per cent. on the latter, all free of income-tax, should be paid on the 4th of January next. The amount carried forward to the new account will be £37,996 7s. 11d.

The Director who retires by rotation is Arthur Lucas, Esq.; and the Auditors (A. T. Eastman, Esq., and I. A Crookenden, Esq.) also retire. These gentlemen, being eligible, offer themselves for re-election.

The CHAIRMAN, in moving the adoption of the report and accounts, said he had not a great deal to tell the shareholders beyond this—that the Company had on the whole been more prosperous than many other gas companies in the past year. He thought the reason of this was that they had not felt so immediately the general depression in trade as most other companies had done, although now they were beginning to feel it most seriously. It was a remarkable fact that all over the Continent, as in England, trade had been very bad indeed during the twelve months; and the decrease in business had affected gas companies generally, as was to be expected, because their prosperity, to a very great extent, depended upon the prosperity of the persons who used gas. In addition to this, it was to be remembered that, during the past summer, there was an extreme amount of heat and light; and this had affected the consumption of gas. Under these circumstances, he considered the Company had been especially fortunate in not only having made the same profit, but a somewhat increased profit. There were certain other points in regard to their business to which he alluded at their last meeting, and to which he again desired to refer. There was, in the first place, the question of the coal contracts. On the previous occasion, he pointed out that the price of coal must, of course, mainly settle what the profits of a gas company were to be; and therefore they would suppose that, on the first blush, if coal declined in price, the profits would increase. But this was not the whole view of the case, because, when coal fell, their residual products fell too; and upon these products also their profits largely depended. Very often coke dropped in price even more rapidly than coal; and they felt the effect of this at once, while the benefit of the fall in the price of coal was, as far as they were concerned, deferred for a considerable time. The Board had thought it prudent to proceed upon the principles which had been adopted by the Company on previous occasions—viz., when a favourable opportunity occurred for making a long coal contract, they had done so as far as they could; and this enabled them to calculate more accurately their position and prospects. As the proprietors would have observed in the report, a small increased dividend had been paid by the Union des Gaz, in which their Company were largely interested; and the Directors had considered it wise to utilize this extra dividend in writing down the stock of the Company which they held on behalf of the proprietors, and which could not be increased, to its par value. As to the future, he looked forward to it with considerable anxiety. The strike of the coal miners affected not only England, but the Continent; and, as the proprietors were aware, anything that touched the stability of their business was a serious matter. The Company had the great advantage of having their business scattered over a large number of, comparatively speaking, small stations; and, therefore, they had a very abundant security. Then they had pursued the policy of which their late Chairman (Mr. H. M'Lauchlan Backler) always approved—that was getting the Company's concessions extended as long as possible; and in order to secure those extensions, they had to reduce the price of gas to the consumers. This was the only method by which gas companies working on the Continent could expect to have a prosperous career; and it was the method the Board would always endeavour to pursue. There had been an unfavourable item in that the exchange from Italy had been somewhat high. The Italian budget was in great disorder. The country was passing through one of those periodical changes of Ministry which occurred in France as well as in Italy, and which affected the exchange. This would also lead the Directors to be careful in calculating what the profits might be in the future; and he thought, if they could maintain their position, they would do very well. They had always been most careful in not anticipating anything which might be earned; and the proprietors might be certain that anything which was offered to them by the Directors would have been honestly and fairly earned. Under the circumstances, he believed they would be well satisfied that the Company was in a prosperous and sound condition, and, as far as one could look forward into the future of gas companies, it was as reassuring as that of any other company he knew of. He had been asked by the Secretary to state that a number of the stockholders had not obtained their new stock certificates; and it would be a matter of convenience to the office if these were taken out at once. In conclusion, he said the business of the Company was carefully attended to; and some of the Directors constantly went to the Continent to look after their affairs. He had himself during the year taken a long tour, in order to examine the requirements of the future at many of the stations. Altogether, he believed the Company was as well administered as any of which he had knowledge.

Mr. N. E. B. GAREY seconded the motion, which was unanimously carried, without discussion.

On the proposition of the CHAIRMAN, seconded by Mr. H. WOLLASTON BLAKE, the dividends recommended in the report were declared.

The CHAIRMAN then moved, and Mr. F. TENDRON seconded, the re-election of the retiring Director (Mr. A. Lucas). This having been agreed to, the Auditors (Messrs. A. T. Eastman and I. A. Crookenden) were re-appointed.

Mr. H. D. ELLIS, in proposing a vote of thanks to the Chairman and Directors for their exertions in conducting the business of the Company during the year, said it was a matter of great satisfaction to him to find they had dealt with the increased dividend derived from the Union des Gaz in the manner they had done. There had been Boards who had been tempted to declare a higher dividend out of accrued profits. But he was entirely opposed to that; and he thought the mode in which they had dealt with the money had strengthened the position of the Company. He was pleased they had a Board of Directors who would not yield to clamour for a higher dividend when the proprietors already had a good one. He adverted to the eminent services of Mr. Backler to the Company, and remarked that they might be said to enjoy an almost perpetual succession of experienced Chairmen.

The motion having been agreed to,

The CHAIRMAN, in acknowledging the compliment, said he entirely concurred in the opinions expressed by Mr. Ellis. The Board thought that nothing ought to be omitted by them which would strengthen the position of the concern; and it was right to go upon conservative principles. Seeing they were paying a dividend of 13 per cent., they were confident the proprietors would agree that the course they had taken

as to the extra sum received from the Union des Gaz was the right one. He likewise concurred with the kindly reference which had been made to Mr. Backler, whose loss they all deplored.

A vote of thanks was afterwards passed to the Secretary, the Managers and Engineers, and the staff; and the proceedings terminated.

SOUTHWARK AND VAUXHALL WATER COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Tuesday, at the Offices, Southwark Bridge Road—Alderman Sir H. E. KNIGHT in the chair.

The SECRETARY (Mr. Alfred Jelley) read the notice convening the meeting; and the report of the Directors was taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the Directors were glad to have the pleasure of again meeting the proprietors, especially as they were able to submit a very excellent account of the position of the Company and of the progress made during the past six months. With regard to the accounts, they had overspent the capital account by £21,000—that was to say, they had spent more than they had received of the £300,000 which Parliament authorized them to raise in 1891. This, however, only pointed to the fact that, between now and next March, they would have to obtain a further sum by the issue of debentures. With reference to the working expenses on revenue account, he desired first to call attention to the charges under the head of "Maintenance." These amounted to no less than £42,435, compared with £38,026 in the corresponding period of 1892; showing an increase of £4400 in the item in the past half year. This, however, was not an advance which they might take seriously to heart, for it had been caused by temporary circumstances. There had been a rise of £1000 in the rates and taxes; and this left £3400 to account for. The charges for distribution had been £10,100, against £8310, or an increase of £1790. This was mainly owing to the severe winter last year, which froze many of their mains, and necessitated the lowering of them, in order to prevent such a thing occurring again. This, however, was an extraordinary outlay, and accounted for a large proportion of the balance of the increase mentioned in the maintenance charges. During the half year, too, they had had to expend an extraordinary amount on washing sand, which had added to the expenses to the extent of between £500 and £600. There were some small advances in other items, which would fully account for the increase in the maintenance charges; and, as he had said, they were not normal but exceptional increases. There was nothing for him to call attention to under the head of "Management," except the law and parliamentary expenses, which in the present accounts stood at £1699; being an increase of £719 on the September half of 1892. This was mainly owing to the expense the Company had been put to in defending their interests before the Royal Commission—a matter to which he would refer again later on. On the other side of the revenue account, a reference to the items showed how the Company had been progressing. The income for the half year under review had been £119,148—a rise of £4881 over that of the September half of 1892; while the increase over the six months ended in March last had been no less than £10,832. Taking the whole year together, the income for the past twelve months had been £227,464, or an improvement of £6300 over that of the preceding year. These figures denoted great prosperity, and indicated the innate vigour in the Company's business. The figures were evidence not only of an advance for the year, but that the Company might calculate on an approximate, or, he might say, increasing amount in future years; for he might inform the proprietors that the augmentation of £6300 in their income last year was a rise of £400 or £500 on the increase of the preceding year, when the improvement recorded was about £5800. They had, therefore, not only a considerable increase, but a steadily progressive one, which was a good characteristic of the stable position of the Company and of their prospects. The allowances for empty houses, overcharges, and bad debts, he had again the satisfaction of stating, showed a decrease; having been £4542, as compared with £4600 last half year, and £4800 in the preceding six months. The decrease had been going on, in fact, for many half years; and it was very gratifying, exhibiting as it did the satisfactory way in which their money was collected. The amount to be carried to the dividend and interest account was £64,441, as compared with £66,644 in the corresponding period of the previous year; being a smaller amount by about £2203. This, however, was not actually the case, because the surplus out of the allowances account in the corresponding period of 1892, which they carried forward, was £3600; whereas this year it was only £867. The difference between these two amounts was therefore to the advantage of the September half of 1892. Deducting this difference from the sum to which he had referred, they would find a larger amount carried to dividend and interest account by £555 than they placed to that account a year ago; and this notwithstanding the fact of the £3000 of extraordinary expenditure on account of maintenance, to which he had alluded. The net amount applicable to dividend was £35,332, as compared with £38,111 in the corresponding period of 1892; but he had already explained that, although there was apparently a smaller sum to deal with, the amount was actually larger, making allowance for other items to which he had referred, by £1153. They proposed to pay a dividend of 6 per cent. per annum, which would absorb £30,861, and leave them £4471 to carry forward, against only £746 last half year. The shareholders would therefore see that the financial position of the Company was very much improved. They had, in fact, actually earned over 6½ per cent. in the half year under review; but it would be unwise—he might use even a stronger term—to distribute a dividend of this amount, because they knew that the current six months constituted what they called their bad half year. They did not know what their expenses would be through frost or any extraordinary items; and they knew that their revenue would be about £6000 less than it had been in the past six months. In these uncertain times, he hoped they would be able to form a sort of reserve fund; so that, if any unexpected claim came upon them, they would be able to meet it without trenching on the regular dividend. Turning to the report, there was nothing particular to mention until he came to the fourth paragraph. He might tell the proprietors that they had now at Hampton one of the finest, if not the finest range of filter-beds of any of the Water Companies. They had ranged side by side no less than nine acres of filters, whereas only a few years ago they had but three acres. This accession of filtering power had placed them in a position to do their work in a thoroughly efficient manner, and to distribute the water in their district in the same high condition of purity that they had been able to do for many years past. They were also constructing a large storeage reservoir at Hampton. Long before the issue of the report of the Royal Commission, the Directors foresaw the necessity and the great importance of storeage; and they therefore commenced the construction of a very large storeage reservoir at Hampton. As the proprietors would remember, he explained this matter to them two or three years ago; and he called attention to the site upon which it was being erected. It was now making very satisfactory progress, and was beginning to assume a shape which showed how it would add to their power in carrying out the duties which Parliament had entrusted to them. They were also progressing with their pumping-station at Streatham, in order to utilize the well they had there. From this well they felt satisfied they would be able to obtain a few million gallons of water daily, which would assist them in furnishing the quantity now required to be supplied to their district; and from the success of this work, they hoped to be able to draw the deduction that they would be able, by resorting to wells, to increase the supply of water of perhaps a higher standard than that which they obtained from the Thames, although this would be very difficult. They hoped they might be encouraged, by the experience of this well, to try elsewhere, and obtain similar results again. With regard to the report of the Royal Commission, the proprietors had probably all read it, or if they had not done so, had obtained a very good idea of the nature of it from the Press. The Directors had taken two paragraphs of the report and had inserted them in their own report on the present occasion, as they affected the question of quality and purity as well as that of quantity. It used to be thrown in their teeth that London water was very deficient in quantity and also in quality; and all sorts of hard words were used against the character of the Metropolitan Water Supply. They themselves knew all along that there was not the least truth in these assertions; and they only waited for the proper time to place the facts before a proper authority. The result was the report in question. With regard to quality and purity, this was what the Royal Commissioners said:—

> We are strongly of opinion that the water as supplied to the consumer in London is of a very high standard of excellence and of purity, and that it is suitable in quality for all household purposes.

This was what the Commissioners said, after hearing all that could be stated for and against the water. As regarded the question of quantity, they had been threatened with a water famine. Schemes were broached showing that they must spend millions of money to go to Wales—or America, or France, perhaps, some engineers would say—in order to bring water to London to supply the wants of the Metropolis. This question was thoroughly fought out before the Commissioners, as the proprietors might imagine it would be when it came before such a body, composed of men who perfectly understood their work—men of scientific eminence in each branch of the inquiry. Well, the question was fought out; and what was the result? This was what the Commissioners said:—

> With respect to the quantity of water which can be obtained within the watersheds of the Thames and the Lea, we are of opinion that, if the proposals we have recommended are adopted, a sufficient supply to meet the wants of the Metropolis for a long time to come may be found, without any prejudice to the claims, or material injury to the interests, of any districts outside the area of Greater London. We are of opinion that, by the construction of storeage reservoirs in the Thames Valley, at no great distance above the intakes of the Companies, it will be possible to obtain an average daily supply of 300 millions of gallons, without taking in any objectionable part of the flood water.

This was what the Commissioners said on the question of quantity. The Water Companies knew perfectly well that this was so, long before the Royal Commission was appointed; but they could not put their case forward until a proper authority was established to receive it. It would have been useless had they done so; and the facts which they might have given would only have been used, if possible, to the disadvantage of the Companies. They therefore waited until the right time came; and then, having collected and put before the proper authority their evidence, the outcome had been the report from which he had quoted. They thoroughly concurred with the recommendations of the Royal Commissioners as to storeage reservoirs. They were constructing one already; and they were applying to Parliament in the next session for a Bill to enable them to fulfil the requirements as stated in the report of the Royal Commission. It was a matter which they would approach with very great care, but with a sincere and earnest desire to do the very best they could for themselves as a Company, and also to carry out the recommendations of the Royal Commission, because they felt that those recommendations were of such a nature that they ought to be carried out. The report of the Royal Commission came to this: "The water the Companies supply is excellent; they are doing their work well; they know their business; and you had better leave them alone." He thought it very hard, however, that they should have had to obtain this report at such a large expenditure, which he had no doubt would be between £20,000 and £30,000. What was spent on the other side, he did not know; but it must have been very large, in order to obtain a result which simply confirmed the satisfactory position of the Metropolitan Water Supply and the Companies which provided it. They had to stand on their defence, however, and they had continually been obliged to do so. Ever since he had had the honour of being Chairman of the Company, they had had to be fighting to maintain the interests of the proprietors, and to avoid damage being done to their property. In due course, the provisions of the Company's Bill would be fully explained, and the proprietors' sanction would be asked to it. Meanwhile, he could not say more than that the Company were, in this measure, endeavouring, to the best of their judgment, and in the most economical manner, to carry out the recommendations of the Royal Commission.

Mr. C. M. VIALLS seconded the motion.

Mr. JEFFREYS, referring to the remarks of the Chairman regarding the increase in the law and parliamentary expenses, said that, being interested in the New River Company, he had also found the same feature there. Alluding to the harsh manner in which they, as shareholders in Water Companies, were treated by their servants the London County Council, he said the Council were spending the ratepayers' money, and were over-officious. If they would attend to their duties as laid down by the Act of Parliament, and study the interests of the ratepayers, it would be better for the community. In face of the report from which the Chairman had quoted with regard to the quality and quantity of the water supply of the Metropolis, the Council were again going to Parliament for power to obtain another supply. As a ratepayer, he should like to know, before the Council incurred any very large expense, where they proposed to bring their supply from, at what cost, and the quality of the water, so that the consumers and the ratepayers might make comparisons.

The motion was then put, and carried unanimously; and the dividends were afterwards approved.

A resolution was next passed authorizing the Directors to contribute £20 annually, subject to certain conditions, towards the maintenance of the Hampton School, so as to prevent the establishment of a School Board.

The retiring Directors (Sir H. E. Knight, Sir R. H. Wyatt, and Mr. V. B. Tritton) having been re-elected, and Mr. T. P. Child re-appointed an Auditor of the Company,

A vote of thanks was accorded to the Chairman, Directors, and officers, and the proceedings terminated.

GRAND JUNCTION WATER-WORKS COMPANY.

The Half-Yearly General Assembly of this Company was held last Wednesday, at the Offices, 65, South Molton Street—Mr. FRANCIS TAGART in the chair.

The SECRETARY (Mr. J. Goodwin) having read the notice calling the meeting, the report of the Directors was taken as read.

The CHAIRMAN said he wished their colleague Lord Knutsford, who kindly undertook his (Mr. Tagart's) duties at the last meeting, was in the chair on the present occasion, as he would have better amplified the report, and would also have dealt with matters more ably than he himself could do; those matters being of transcendent importance—infinitely more important than the accounts which they had to present. He desired first to briefly refer to the loss they had sustained by the death of their old and valued friend, Mr. T. Hawksley, who was a great authority—some might think he was not going beyond the mark if he said the greatest authority for many years on all matters connected with the supply of water to towns in this country. It was owing to Mr. Hawksley's arduous labours and long-life experience that the Thames was the main water supply for the Metropolis; and no doubt his evidence in part had influenced the minds of the gentlemen forming the Royal Commission. Mr. Hawksley died "in harness" within a week of the issue of the report confirming his views. Passing to the accounts, the Chairman remarked that the first item in the revenue account which would strike the proprietors was the increase under the head of maintenance. This was due to many causes. They had supplied their district with a great increase of water in the past season; and it had cost them £510 more for fuel for pumping an extra 255 million gallons. The repair to the tower at Campden Hill—he might almost say its restoration—had cost them £337. The fact that there were 27 weeks in the past half year accounted for an increase of £300 in wages; and the item of salaries and wages naturally had advanced—there being an additional charge for the cost of the waste inspection as their system of constant supply had been extended. The main increase, however, was in the cost of filtration. The new sand filters at Kew and Hampton had cost £570; and the cost of fuel for pumping water into the reservoir and the filters at Hampton had been £636. These sums added together fully accounted for the increase of about £2000 under the head of maintenance. With respect to the item of filtration, he quoted from the last two reports of Dr. Frankland, remarking that the one for October stated that: "The water was, in every case, efficiently filtered; that delivered by the Grand Junction Company was equal, and the remaining waters were nearly equal, to deep-well water in chemical purity." In his report for November, Dr. Frankland said: "The water in every case was efficiently filtered"—that was referring to all the Companies. He (the Chairman) thought that, in face of these reports, the money expended upon filtration was amply justified. He must warn the proprietors that not only as a matter of expediency, but also as a matter of necessity, they might find this expense increase. With regard to the cost of management, nothing called for any remark, excepting the increase in parliamentary expenses, which had been £939 in the past half year, as compared with £645 in the corresponding period of 1892. He had, on a former occasion, prepared them for this increase by telling them that they would have to pay the expenses connected with the Royal Commission; and it must be very gratifying to them that this money had not been thrown away. On the other side of the revenue account, there was only one item that called for any remark—viz., the half-year's water-rental, which had been £99,305, as against £97,036 for the September half of 1892; showing an increase of £2269. The outcome of the revenue account was that they had a sum of £49,230 available for the payment of dividend on £1,200,000 of share capital. This enabled them to offer the shareholders a dividend of 8¼ per cent. per annum on the ordinary shares. This seemed brilliant; but he feared that there were very few of the original shareholders remaining to enjoy the benefit of such a dividend, and, in reality, the return was only a modest one on the present price of the shares. He, however, felt quite sure that it would be maintained. Turning to the report, he remarked that all the works were in an efficient condition. The Directors had visited them personally, and had found them in perfect order. They had also paid a visit to the sites suggested for storage reservoirs by Mr. Hunter and Mr. Fraser at Staines; and whether they looked at the levels, the geological formation of the land, the proposed intake, its proximity to the works of all the Companies drawing water from the Thames, and also to the present value of the buildings upon the land, with the view to their being purchased at a reasonable price—in all these aspects, these sites seemed to the Directors to be admirably adapted for the purposes of the proposed reservoirs. With reference to the protracted heat and drought of last summer, when they met in June, there had been a very trifling rainfall even from the beginning of March; but there was no indication then that the exceptional drought was about to cease, and, in fact, it continued up to the end of September. He believed that in that month the people were worse off for water in the country than at the end of June. During the whole of this time, however, the first necessity of life had been supplied in London with regularity and abundance; and even the roads had been watered without stint or hindrance. He thought he was justified in saying that it was a matter for congratulation—even, of thankfulness—that the Water Companies had been able to do their duty in this way in such a very trying year. The proprietors would remember that from time to time the Directors had mentioned in their reports the number of houses supplied on the constant system; and they had now the satisfaction of saying that the whole of the Company's district, without any exception, was supplied on this system, which must be a great source of satisfaction and comfort to their customers. The fixing of fire hydrants to the mains would be also completed shortly. Of course, the question of the coal supply, in view of the late strike, had given them some anxiety; but he was glad to say that, through the prudence and foresight of their Engineer, they had been always well supplied at all their stations, and had never been under any apprehension. With regard to the report which had been issued by the Royal Commission, the Directors had congratulated the proprietors on its favourable character. He could only at the meeting refer to the conclusions arrived at by the Commissioners, which were clear, direct, and unmistakable. One conclusion to be drawn from the report was this—that the Lea and the Thames could, if properly treated, and without interfering with the flow or the beauty of the rivers, supply the wants of the Metropolis for 40 or 50 years to come, even supposing the population enormously increased. Another conclusion was that the water, as now supplied, was of excellent quality, and that this could be maintained. But how was this to be done? It was to be done by a scheme of storeage; and the scheme suggested by Mr. Hunter and Mr. Fraser had been endorsed and approved by the late Mr. Hawksley and Sir Frederick Bramwell, in these words: "We beg leave to express our opinion that the sites proposed for the reservoirs are suitable for their intended purposes, and that the reservoirs are capable of being constructed at a moderate expense." On the same subject, the Royal Commissioners remarked: "Broadly speaking, and without committing ourselves to details, we may say that the conception of the Staines scheme of storeage commends itself to us as the best which has been suggested. It affects but a short run of the main river, and none of the tributaries. It can be carried out by stages, as the demand for water grows, and can be delayed or stopped entirely, as circumstances may dictate, in the future. On economical grounds, it thus has a marked advantage over the Kennet scheme." The Commissioners said further: "The proposed sites for storing the water of the Thames at Staines are, from a geological point, quite unobjectionable. They lie upon the alluvial plain of the river, and will require to be excavated in the sheet of gravel which forms that plain." It might be said by them concerning the report of the Royal Commission: "We accept it; we must have accepted it, even if it had been unfavourable to us." That was so; but there were two ways of accepting it. They might acquiesce in it tacitly, ignore it, or evade it, or, as had been suggested in some quarters, they might override it. There was another way to accept it, however—to accept it loyally, and to try to carry out the recommendations conveyed in it promptly, and with a spirit of determination. He was the more led to say this because in the preamble of the Bill of the London County Council now before Parliament there was this clause: "Whereas it appears that the existing means of water supply are inadequate." He should hope that, on looking into the report of the Royal Commission closely, the London County Council would withdraw that clause. Mr. Pember said, in his address to the Committee of the House of Commons on the Metropolitan Water Supply—the words were important, and the Royal Commission had not been appointed at the time: "No Royal Commission would sit to determine a point about which it was immediately told that its conclusions would go for nothing." Mr. Gladstone, too, in the debate in the House of Commons last month, alluding not to the late, but to another Royal Commission, said: "He did not think that, in a case of this kind, the Government ought, under any circumstances, to attempt any authoritative interference with the discretion of the Commission. A Royal Commission was a serious affair, which ought to carry great weight; and, if it was to do so, it must possess a considerable degree of independence. Therefore, even if he differed from the views of the Commission—and he did not say that he did so—he thought it would be a serious matter to interfere with their discretion." These utterances bore on the question of urgency; and the report of the Royal Commission was signed without any dissentient throughout. It was the result of a long and exhaustive inquiry by men of science—by chemists, geologists, and men of great experience, gifted with sound judgment. That being so, they were bound to do their best to carry out the recommendations of the report; and they might be encouraged, too, by what had appeared in the Metropolitan Press. As they were aware, the Press formerly took a view adverse to the Water Companies in general; but the report of the Royal Commission had considerably altered their views. After quoting from the articles which appeared in *The Times*, the *Daily Telegraph*, the *Morning Post*, and the *Daily News* on the report, he remarked, with reference to the question of urgency, that he would be very glad if they could act in conjunction with the other Companies, aided by their Engineers, Secretaries, and officers. He really believed that, in this way, a plan might be devised to carry out the scheme of storeage reservoirs for which they were so much indebted to Mr. Fraser and Mr. Hunter, whose services had been invaluable not only to the Grand Junction Company, but also to all the London Companies. They had already communicated with the Local Government Board that the report was receiving serious consideration, and that they were considering how the plan of storeage reservoirs could be carried out. As he had intimated, he thought it

was their bounden duty to act promptly in regard to the recommendations contained in the report of the Royal Commission. This was their duty now, and in the immediate future. They must not, however, in the present, be too elated with regard to that report. They must not slacken their efforts; on the contrary, there was everything in the report to encourage and stimulate them in the performance of their duty. He would only add, in the face of the report: Be of good courage; take heart, your property can never be confiscated, nor even unduly depreciated. Your works cannot be thrown over as worthless or worn out, nor can your mains be sold for the price of old iron. He concluded by moving the adoption of the report and accounts.

The Right Hon. Lord KNUTSFORD, in seconding the motion, said he need hardly add anything to what had been so clearly put before them by the Chairman. He only desired to express—what he was sure every shareholder must feel—their deep gratitude to Mr. Hunter and Mr. Fraser for the excellent, the all-important work they had done. They also felt a special pride—though they did not wish to put this point forward too much—in thinking that the scheme of storeage reservoirs had originated with the Grand Junction Company.

The resolution was carried unanimously.

On the motion of the CHAIRMAN, seconded by Dr. CHESSHIRE, the dividends recommended were afterwards declared.

Mr. A. J. BAKER said that every shareholder must be thoroughly satisfied with the Directors' report. With reference to the proposal which had emanated from Mr. Hunter and Mr. Fraser, those gentlemen had devoted a great amount of care and thought to the subject; and he considered that some special recognition was due to them. If the report of the Royal Commission had been unfavourable, the stocks of the various Companies, instead of having appreciated, as they had done since the report was issued by about 10 or 15 per cent., would have depreciated by 20, 30, or 40 per cent. He therefore considered that some recognition should be made by all the Water Companies of London of the services which had been rendered by Mr. Hunter and Mr. Fraser. He suggested that the Directors should be asked to be empowered to treat with the Boards of the other Companies on the subject, and that they should be authorized themselves to vote at least 500 guineas to any sum that might be awarded by all the Metropolitan Water Companies.

The CHAIRMAN said that the Directors were much obliged to Mr. Baker; for his remarks showed that the shareholders endorsed the feelings that had been expressed by the Directors regarding the services of Mr. Hunter and Mr. Fraser. The suggestion would not be lost sight of; but he felt sure that Mr. Baker would leave the matter to the discretion of the Board.

Mr. W. HUNTER, J.P., said that Mr. Fraser and himself were much indebted, not only to the Directors but also to the proprietors, for the kind remarks which had been made regarding their services in the matter referred to. He need scarcely say that they took up the question first of all purely as a matter of duty. He had felt very strongly that the Companies were upon their trial. He might say that perhaps the reason why he had been enabled to take the view that he had done was that he had had the advantage of communing from time to time with the late Mr. Hawksley, who was always of opinion that the Thames and the Lea were the right sources for the supply of water to the Metropolis. By following very closely the evidence given before the Commission, they clearly saw that there was plenty of water in the Lea and Thames to supply the wants of London for 50 years, and even, as he thought he had shown in his evidence, for many years beyond. When the report of the Royal Commission came out, he felt bound to say that Mr. Fraser and himself were very pleased at what was said in it. They did not think that any special scheme would be recommended by the Commissioners; but when they saw their own views—almost their words—reproduced in the report, it was very gratifying to them. The gratification, however, was not simply personal. They would never have been able to raise the superstructure they had reared unless the Directors of this Company and of all the other Companies had pursued for years a sound and proper policy on which this building could be erected firmly and solidly. It was to the Directors of the Companies generally that the shareholders owed the fact that they were able to take up the scheme referred to. He would like to mention that, if the scheme were carried out, it would not only provide the water necessary for the supply of the Metropolis, but the minimum flow of the Thames would be increased by 45 per cent. One great feature of the scheme was that the reservoirs in question could be made from time to time, as they were found to be wanted—not on an experimental basis, but as the real wants of London arose. It seemed to him, looking at the matter entirely apart from personal considerations, that the only true policy of the Companies was to accept the report of the Royal Commission loyally and to carry it out; and to that object the efforts of the Directors were now tending.

On the motion of Mr. J. BEST, a cordial vote of thanks was passed to the Chairman, Directors, and officers.

The CHAIRMAN briefly acknowledged the compliment; and the proceedings then terminated.

JOHANNESBURG WATER-WORKS, ESTATE, AND EXPLORATION COMPANY, LIMITED.

A Meeting of the shareholders of this Company was held on Tuesday last—Mr. W. G. SOPER in the chair.

The notice convening the meeting having been read,

The CHAIRMAN, in opening the proceedings, expressed regret at the absence of Sir J. Sivewright and Mr. B. I. Barnato from the meeting, as they could have spoken to the shareholders from direct information. However, the London Board were in possession of full information as regarded revenue and expenditure, and also as to cash. A question had been asked by letter regarding their relative revenue running over one or two years. He had great pleasure in stating that the gross revenue derived from water in 1891 was £25,736; in 1892, £29,048; and in 1893, £35,748. The revenue from the estate portion of the Company was £8750 in 1891, £7512 in 1892, and £7276 in 1893. It would be affectation on the part of the London Board if they were not to appreciate the fact that great uneasiness had of late been manifested in respect to the present position and the propects of the Company; the question which was creating alarm being that of water. He thoroughly agreed with the principle that a municipality should supply both water and light; but if industrial companies established for these purposes existed anterior to the municipality being able, or, if able, willing to practically adopt and carry out this principle, those companies, he claimed, were entitled to receive at the hands of the municipality a full and liberal consideration of their rights. The Water Company had been in existence six years; and it was only now that the Sanitary Board had taken up the question of the supply of water to the town of Johannesburg. The Directors admitted that the Sanitary Board had approached the Company on the question of the future supply; but they contended that the Company had not been indifferent to the situation. Their storeage capacity at the present time stood at 31,814,000 gallons; and, the daily consumption of water in Johnnesburg averaging about 750,000 gallons, they had thus 42 days' supply of water, assuming not a drop of rain fell. In addition, there was a continual outflow of the springs, which yielded 862,000 gallons per day; and it was a remarkable fact that, even during drought, these springs gave forth a very large quantity of water. The Directors, therefore, felt that they had taken the important step of providing sufficient storeage in the event of drought arising. The next important question was the desirability of obtaining fresh supplies. In this respect the Company had not been inactive; for he held in his hand the report of the Sub-Committee appointed by the Johannesburg Board to examine and report upon the various schemes for the supply of water offered to the Company. But the great scheme they had to face was the Wonderfontein proposal, which had been made and adopted by the Sanitary Board. In September, 1891, the London Board had a report from Mr. Andrews, the Company's Engineer, which was antagonistic to the adoption of that scheme; and even the Sanitary Board were not unanimous on the subject. The scheme simply gave the right of the purchaser of the concession to one-quarter of the supply of water there; and, independently of that, the riparian liabilities which would have to be faced were of such a nature that it would have been absolutely unwise for any water company to take up the scheme, and face the contingent liabilities which were certain to arise from the riparian owners adjacent. The London Board, he thought, would not have felt that the Johannesburg Board had acted with that prudence and discrimination which had characterized them, if, in face of these contingent liabilities, they had secured the Wonderfontein proposal. Moreover, the ratepayers of Johannesburg were not in favour of the scheme; for he had learnt by cable that, at the meeting at which it was considered, there was a tremendous uproar, and no result was arrived at. The next question was, what relation could the scheme have, if adopted, to the Company? There were three possibilities, according to his view. The first was the purchase, out and out, of the water-works portion of the Company. If the Sanitary Board were to propose such an arrangement as this, what harm could it do to the shareholders? Would it not have a beneficial effect? The second possibility was the leasing, at a rental, of the water belonging to the Company. Mr. Barnato made such a proposal in his speech. Mr. Solomon, on behalf of the Sanitary Board, suggested that it should be considered, and that a Committee of the Board should meet the Directors to discuss the situation. This, however, was thrown out; so that the Company were still in their old position. The only other possibility he could conceive was that the Wonderfontein or some other proposal should be adopted by the Sanitary Board, and that the supply of water should be offered to Johannesburg in competition with the Company's supply. How would the Company stand then? There were two chief residential districts of Johannesburg—Doornfontein and Jeppestown. For the latter district the Company had the exclusive right to the supply for 80 years; and for the other they claimed this right, though it was disputed. If the population advanced in number, these places would probably, in the future, take as much water as the Company now had to supply. But as regarded the town of Johannesburg itself, if it really came to a question of competition, he could not see that the Company would be in the worse position of the two; for if they made a reduction in the price of water to the extent of 1s., their opponents, with a capital double or treble the size of the Company's, would have to make a reduction of 2s. or 3s. as the case might be. Concluding, he deprecated the existence of any antagonism between the Company and the Sanitary Board; but he claimed that, as the Company had supplied a felt want for years before the Board took up the question, some rational *modus vivendi* should, after amicable discussion, be found, whereby the rights of the Company should be preserved intact, and yet the wishes of the Municipality be fully observed. He moved—"That the names of the present gentlemen on the London Board, with or without one additional, as this meeting may desire, be submitted to the Johannesburg Directors for election as your London representatives."

Mr. S. W. WATSON seconded the motion, which, after a brief discussion, was unanimously agreed to.

A vote of thanks to the Chairman terminated the proceedings.

Toronto Consumers Gas Company.—The report of the Directors of this Company for the twelve months ending Sept. 30 last states that in this period 1131 new services were put in, and six miles of mains laid; bringing up the total length of mains to 220 miles. Having been satisfied, from the estimates of the General Manager (Mr. W. H. Pearson), that they could afford to do so, and believing in the policy of selling gas at the lowest figure consistent with the security of the stockholders, the Directors made reductions in the price in April last. These have resulted in a largely increased consumption of gas, especially for fuel purposes, the percentage of which upon the total consumption increases annually. The following comparative figures in regard to the receipts will show the prosperity of the Company: Gas-rental in 1892, $512,554; do. in 1893, $551,617—increase, $39,063. The Directors feel that they are only doing justice to the General Manager in stating that the flourishing condition of the Company's business, and the efficient working of every department, are largely due to his ability, energy, and careful supervision, and to the fidelity of the staff by whom he is so ably supported.

THE PROPOSED NEW GAS-WORKS FOR BLACKBURN.

Criticism of the Scheme.

The proposal of the Blackburn Gas Committee to erect new works for the manufacture of gas, to which reference has been made in recent issues of the JOURNAL, was subjected to criticism on the presentation of the Gas Committee's minutes at the last meeting of the Town Council. Mr. Kenyon predicted that the proposed expenditure of £15,000 would be followed by the spending of an additional £100,000; and he contended that the site selected for the new works was unsuitable, not only on sanitary grounds, but because it was 60 feet higher than the level of the existing works, which would result in great loss by leakage. It was stated that the new works were urgently needed in order to keep pace with the consumption, which, in round figures, was at present 3 million cubic feet per day. On looking up the figures in the Borough Treasurer's annual statement, he found that, during the last four years, there had been no increase whatever in the consumption. He contended that if it were necessary to go in for increased plant, it could be better added at No. 2 works, where they had 5 acres of land, and where an additional 7 acres could be obtained. On this land plant could be erected to augment the production by 4 to 5 million cubic feet per day, which would meet any possible increase in the consumption for years. Mr. Riley gave the Gas Committee every credit for having the interest of the town at heart; but he said that, as the scheme was only just in its inception, there could be no harm in referring the matter back for further consideration. He strongly urged the Council not to rush without due reflection into the new and expensive scheme proposed; and he expressed his confident belief in the alternative proposal of Mr. Kenyon. The price of gas in 20 towns in the country ranged from 1s. 10d. to 2s. per 1000 cubic feet, whereas in Blackburn it was 3s. 7d.; and an additional 3d. or 6d. would be a great burden to a working man. Mr. Whiteley said it was false economy to strain plant and machinery in producing more gas than they were intended for. He supported the scheme for the proposed new works as a wise provision for present needs and future supply. The new works would certainly lower the price of gas in the course of five or ten years. Alderman Eastwood twitted Mr. Kenyon on his muddled and confused figures; and said that he should like to see the coal carried to the No. 2 works by railway. He questioned very much the likelihood of a decrease in the price of gas, and said there was a possibility, which they were bound to consider, of electric lighting doing away with the necessity for gas-works. Mr. Hamer said the whole question had been fully discussed by the Gas Committee and by experts; and it was clear that the new works were an absolute necessity. Mr. Crossley expressed the belief that a scheme almost identical with that advanced by Mr. Kenyon had been considered by the Committee, and therefore it was useless to refer their report back. With regard to what had been said about electric lighting, statistics showed that, in towns where the light had been adopted, there was no falling off in the consumption of gas. Alderman Thompson then replied to the various points raised. He said the suggested extension of No. 2 works would involve buying up other property; and the opinion, not only of the Committee but of experts, showed that the scheme they had submitted was the best and most feasible. Mr. Kenyon said he was not an opponent of the scheme, and had served his object in raising this discussion. He then withdrew an amendment which he had proposed to refer the question back to the Committee; and the minutes were passed.

WIGAN CORPORATION GAS SUPPLY.

The Cost of Gas Production—Strictures on the Accounts.

In the JOURNAL last week (p. 1091), we gave a summary of the statement made at the last meeting of the Wigan Town Council by the Chairman of the Gas Committee (Mr. Holmes) as to the effect of the coal strike on the gas undertaking. These remarks were followed by other speeches, which raised two interesting points in connection with the management of the gas-works.

Mr. J. WILSON said he had received from a local gentleman who took an interest in the subject of gas manufacture an inquiry as to the reason why the price of gas was 3s. per 1000 cubic feet in Wigan, while other places, less favourably situated in some respects, could, and did, charge less. Manchester charged 2s. 3d.; Huddersfield, 2s.; Leeds, 2s.; Sheffield, 2s. 5d.; Middlebrough, 2s.; St. Helens, 2s. 8d.; and Bolton, 2s. 3d. Mr. Wilson added that Wigan ought to be in a position to deal with their customers as favourably as other towns in Lancashire; but, as he was not a member of the Gas Committee, he was unable to answer the question put to him.

Mr. HOLMES replied that in Wigan a discount was allowed off the price quoted by Mr. Wilson; while in some of the other places referred to, there was no discount. The all-round net price of gas in Wigan was 2s. 5½d. per 1000 cubic feet; and last year the Gas Committee handed over £6000, which was equal to 9d. in the pound on the rates. Another fact to be borne in mind was that they had a very straggling district of supply. There were upwards of 84 miles of mains; and, in a mining district, this meant breakages and leakage. Huddersfield and Leeds were concentrated towns; and there were consequently fewer calls upon the exchequer for fractures of mains. Again, Wigan had adopted a standard illuminating power of 18 candles; while other towns supplied gas of only 16 or 17 candle power, and thus produced an inferior and less costly illuminant. Moreover, they must not forget that the Wigan Gas-Works were purchased from a private Company at an exorbitant price, and that the works had since had to be renewed throughout.

Mr. M'QUAID called attention to the very severe strictures made by Major-General Crozier at the recent Local Government Board inquiry (see *ante*, p. 904), in which he made use of the following remarks: "I must say that your gas accounts have been a great deal of trouble to the Department. It is quite notorious that these gas accounts have been conducted in the most extraordinary manner. The days I have spent myself poring over these accounts have been really too much or anybody." Could the Chairman of the Gas Committee give some explanation of these remarks?

Mr. HOLMES said the difficulty had arisen mainly through the Gas Department spending money before they had obtained sanction to do so. The accounts were classified by the Gas Engineer, and by the assistants of the Borough Treasurer's office. They were, however, not compiled according to Major-General Crozier's ideas; and hence his strictures. The Town Clerk had written to the Local Government Board explaining the whole circumstance.

The TOWN CLERK stated that, in previous applications to the Local Government Board, the figures were compiled according to the mode which was in vogue before he took the office of Town Clerk. In making the new application for borrowing powers, he went into every item of expenditure and estimated expenditure, and re-classified the whole of the accounts; and it was because Major-General Crozier was not able to reconcile this new classification with the old one that he made the remarks referred to. He had since written the Department a long letter, showing that the figures under the two classifications were the same.

The subject then dropped, with the understanding that the Town Clerk's letter would be laid before the Gas Committee.

GAS AFFAIRS AT SOWERBY BRIDGE.

Local Government Board Inquiry—Complaint as to Nuisance at the Works—Increase in Price.

At Sowerby Bridge last Wednesday, Colonel J. O. Hasted, R.E., one of the Inspectors of the Local Government Board, held an inquiry respecting an application of the Local Board for a Provisional Order extending their borrowing powers for gas-works purposes from £82,000 to £102,000, and for sanction to the proposed extensions of the works, and for laying mains from Sowerby Bridge to Luddendenfoot. The Clerk (Mr. R. W. Evans) stated that the population of the district was about 10,700. Their Local Act, however, empowered the Board to supply gas beyond their borders; and they were really the central authority for serving the whole neighbourhood. By a private Act passed in 1861, the Local Board obtained powers by which they took over the Sowerby Bridge Gas-Works, which had up to that time been carried on by a Company. Borrowing powers were then granted to the extent of £40,000. Since then, however, the borrowing powers had been twice increased; and at the present time the total stood at £82,000. Of this £73,000 had already been borrowed. They were now proposing to erect a new holder, &c., on some land which was originally purchased for sewerage purposes. It was intended to utilize 5000 yards; and the price paid for it (6s. 8d. per yard) would be charged to the gas account, making the total under that head £1625. It was estimated that the holder itself would cost £14,600; and there were other items, including a new govenor-house and increased mains, which brought the total of this portion of the application to £20,774. The other part of the application referred to the branch works at Luddendenfoot. It was only fair to say that this item was before the Local Government Board in 1894, when the Local Board had only had the works in their possession for two years, and was then refused. Probably the reason for this refusal was that they had not had sufficient experience of the works to know whether they would be profitable. While, however, the Board were then supplying 7 million cubic feet of gas from the works, they were now supplying over 13 millions; thus showing that they had been carried on with some degree of success. They asked for a loan of £1527 respecting the Luddendenfoot works; and this included the laying of mains from Sowerby Bridge, with the object during the summer months of supplying Luddendenfoot from the Sowerby Bridge works, and having the former works closed. The Gas Manager (Mr. John Marsland) was then called; and he put in several plans connected with the scheme. He stated that the present storeage capacity at Sowerby Bridge was 340,000 cubic feet; and he considered that, in a manufacturing district like Sowerby Bridge, they ought to have at least two-and-a-half days' supply in hand. The increase in gas consumption since 1880 had been 69 per cent. Mr. W. Wood, the Chairman of the Board, was called, and confirmed Mr. Evans's opening statement. There was no opposition.

At the last meeting of the Local Board, a letter was read from Mr. R. Forbes Carpenter, one of the Inspectors under the Alkali Works Act, complaining of a nuisance which existed at the gas-works, arising from the sulphate plant. He stated that he found the purifier in action had not been properly attended to, the oxide had cracked, and gas was escaping all round the edges. He also discovered a leakage of offensive liquid. The Manager had informed him that the man in charge of the apparatus had been forcing the plant beyond its capacity; and this had caused the nuisance to arise. The Gas Committee reported that they had ordered the man in charge of the plant to give more attention to it. A discussion afterwards took place regarding the price of gas; and it was agreed to advance it by 3d. per 1000 cubic feet, from the 25th inst.

Extension of Scrubbing Plant at Beckton.—The Directors of The Gaslight and Coke Company, having decided to improve the scrubbing plant at their Beckton station, recently instructed Messrs. Kirkham, Hulett, and Chandler, Limited, to supply two of their patent "Standard" washer-scrubbers, each capable of dealing with 3½ million cubic feet of gas per day.

A New Gasholder for Nelson.—Last Saturday week, the Mayor of Nelson (Mr. Alderman Hartley) performed the ceremony of turning the valve by which gas was admitted for the first time to a new four-lift gasholder, which has been erected (at a cost of about £20,000) at Brierfield, a mile distant from Nelson. The holder has a storeage capacity of 1,800,000 cubic feet, which is equal to two days' winter consumption in the district. Messrs. Clayton, Son, and Co., of Leeds, were the contractors.

THE COST OF THE BRISTOL ELECTRIC LIGHTING INSTALLATION.

Mr. Preece's Estimates Largely Exceeded.

At the Meeting of the Bristol Town Council last Tuesday, the Electrical Committee submitted a report, in which they asked for permission to borrow £24,000, in addition to the £66,000 originally voted for the electric lighting installation.

Alderman PETHICK, in the absence of the Chairman and Vice-Chairman through indisposition, moved the adoption of the report. In doing so, he stated that the Committee had become liable for £79,920, instead of £66,000, which was estimated to be the cost of the installation in 1891. The Committee, of course, could not check the advice given to them, and they had accepted what Mr. Preece had said. He thought that gentleman would admit they had been very docile; and he could not complain that they had not given him their support. Mr. Preece modestly did not estimate precisely the cost of the buildings; but he put down roughly the sum of £5000 for them, while £24,662 had been spent. The main cause of this was the serious mistake made in the selection of the site. The site was chosen on Mr. Preece's recommendation, having regard only to the electrical view and convenience of situation and necessary space; but Mr. Preece was in no way responsible for the conditions of the foundations. He (Alderman Pethick) certainly regretted that more time was not spent on the selection of the ground. But great pressure was put on the Committee to supply the light as soon as possible; and to that pressure must, to some extent, be attributed the mistake. Having built the river wall, suspicions were then entertained that the rest of the foundations could not be relied upon. It was found only too true, and piling had to be carried out to the cost of £7000, which, with the outlay on the river wall, made a sum of £9659 as having been expended in connection with the strengthening of the foundations. After this, it was discovered that the building was not large enough; and it was extended at a cost of £4402. In carrying out a work of this character, there were always what he might describe as ordinary extras; and under this heading there was £1812. Mr. Preece had estimated for an ordinary commercial building; but the Committee, having the prestige of the chief city of the West of England to maintain, could not accede to a building of that sort. They, however, much regretted the increase incurred above the cost of the original estimate; and they came to the Council to ask them to endorse the expenditure for which the Committee was already responsible, exceeding £18,000, and £5000 additional for works which were still needful. He might say that, in order to secure more customers for the light during the hours that it was not now used, they were going to extend their mains lengthways and sideways. Dealing with the lighting by the arc lamps, Alderman Pethick remarked that, of course, the city had to pay for these; whereas the incandescent light was to some extent remunerative. In the area of the 96 arc lamps, the gas inspector said they would save in gas an expenditure of £1265 a year. The cost to the city for 100 arc lamps would be, according to Mr. Preece, £2500, or nearly double. For himself, he was of opinion that, having obtained this installation, they should gain their own experience in £ *s. d.* before they launched out in the extension of the arc system. With regard to the incandescent lighting, the demand had greatly exceeded their anticipations; and the large places of entertainment and other buildings were asking for the light. There was a quicker demand for it than they had expected. They had 7000 lamps fixed out of 11,000 contracted for; the other 4000 were now being fixed. He had tried to find out what the revenue of the 7000 lamps would be. Taking the week ending Dec. 5, their revenue from the incandescent lighting, excluding the Exhibition, which was only a temporary thing, was £139 6s.; and their experts had tried to give them what they thought the revenue would amount to per annum. A week in December would, however, be an unfair test as to what their revenue in the summer months would be; and, making allowances for this, they reckoned it at £5400. To this must be added other sources of income. The working expenses at present were £6900, against an actual income of £6864, so that this about covered the former. Mr. Preece thought that before 1894 they would have quite 20,000 lamps in use. The question they had to deal with that day was as to the payment of their debts—£18,000; but as to the future, if they determined to consider the matter of extension, he hoped they would not enlarge the present building and go in for extensive piling, but rather select another site.

Mr. HUGHES seconded the resolution; and remarked that Mr. Preece was very sanguine that, at the end of 25 years, the whole installation would be paid for, and the income used for the reduction of the rates. If this had been done with the gas and water concerns, the citizens would have owned them long ago.

Alderman INSKIP agreed with Alderman Pethick that there was a fashionable outcry for the electric light; and this result showed the danger of listening to fashionable outcries from irresponsible people. He felt they had no alternative but to grant the money, although he was one of those who protested against the experiment at the first, and protested against it still.

Mr. TWIGGS observed that, making allowance for the extras needful to make the foundations good, there was not a remarkable divergence between the estimate and the actual expenditure. They had a much better light than ever they had; and he did not think 1d. in the pound would be considered too much for the improvement.

Mr. GILMORE BARNETT, while regretting the enormous blunder which had occurred in the matter of the foundations, thought that the Committee deserved the thanks of the Council and the citizens. Of course, they were bound to pay the £18,000; but before they granted the extra £5000, he considered the Committee should give them a further estimate up to date.

Alderman PROCTOR BAKER maintained that the building was not only in the right place, but it was in the only place available; and, with all its faults, it was in the most economical position. In reference to what Mr. Twiggs had said, he had to find fault with Mr. Preece, because in other matters, where Mr. Preece ought to have known everything, his estimates were fallacious. For instance, his estimate for machinery and plant was £24,000; whereas they cost £30,000. As to the mains, Mr. Preece was singularly near, because his estimate was £20,000, and they cost £20,451; but with regard to the work of distribution, he had erred in another direction. That estimate was £6000; and the work had cost £3500. There were other items of difference; so that he thought Alderman Pethick's criticisms were thoroughly justified. The income from the 20,000 8-candle incandescent lamps would be £11,500 a year; the amount saved by the abolition of gas was £1265; and meter-rent, £280—a total income of £13,045. Including £4800 for interest and redemption, and the interest on the extra £5000 now asked for, the expenses would be £13,290 against an income of £13,045. So that, if the anticipations of Mr. Preece and their officers were fulfilled, there would be sufficient income to pay all outgoings, and pay off the whole capital in 25 years. He thought that the estimate was likely to be realized if the whole of the lighting within the area were taken up. He could not sit down without mentioning a matter of great disappointment. In Mr. Preece's original report, he said he had kept well in view the ultimate installation of the whole of the borough, and that his estimates were based upon the assumption that, sooner or later, the extension would be carried out. He (the speaker) had put every question to Mr. Preece at the time; and he had felt assured that they would only have to extend the mains to supply electricity to districts at present not served. He was intensely disappointed to find that this was not the case; and he thought the Committee, the Council, and the city had great cause of complaint at being so misled. So far as he could learn, it would be necessary to lay down new mains, which meant the pulling up of their streets again, and the whole of this unpleasant process would have to be gone on with as before. He thought that the Committee had made a clean breast of the matter; there was nothing behind, and both the Corporation and the citizens now knew exactly how matters stood. It was a matter for congratulation things were not worse.

Mr. ASHMAN inquired whether they would get any extra arc lamps in the present centre (Cries of "No, no"). Then he could heartily endorse the extreme disappointment. After the remark from Alderman Baker, he thought they could exonerate the Committee from blame, because they had apparently been misled; and the question, he felt, was whether Mr. Preece was capable of advising the Committee.

Alderman DIX said it was perfectly clear the Council were in for a losing game. He should like to know whether the estimates of their receipts were based upon the present system, because he understood the arc lamps were turned out at midnight, and were not alight on Sundays. If they estimated their expenditure upon this, they would find themselves mistaken. He did not think that electricity would supersede gas in the city; and he might inform the members that the output of gas during the past three or four weeks had much increased. The Gas Companyhad no reason to fear the light.

Mr. TODD thought, as the total amount of the estimates had come out so nearly correct, they ought not to criticise Mr. Preece as they had done. They had had an able adviser; and he did not think it should go forth that they were dissatisfied.

Alderman PETHICK said, as regarded the extensions, though no further arc lighting was possible, the additional £5000 would afford money to extend the private lighting within certain limits. He wished to confine himself to facts; but he had heard that some people, finding the electric light more expensive than they anticipated, were considering the question of discontinuing it.

The report was adopted.

NEW WATER-WORKS FOR ST. HELENS.

On behalf of the Local Government Board, Major-General Crozier, R.E., and Mr. E. P. Burd held an inquiry at St. Helens last Tuesday relative to an application by the Corporation for a Provisional Order to repeal, alter, and amend the local Improvement Act of 1869, the Water Act of 1882, and the Corporation Act of 1893—the object being to give the Corporation power to erect a pumping-station at Melling, near Ormskirk, and to construct an aqueduct or line of pipes from there through Melling, Kirkby, Knowsley, and Eccleston. In support of the application, the Town Clerk (Mr. W. J. Jeeves) pointed out the need of a further supply, and the suitability of the proposed site. The practice of the Corporation, he said, had always been to go in for pumping-stations rather than extend the reservoirs. The whole supply was from wells, the tendency of which was to decrease, as against an increasing demand, owing to the enlargement of the population. The first station was erected in 1853 at Eccleston Hill; and it then gave a supply of 1,250,000 gallons of water per day, whereas now it only yielded 570,000 gallons per day. In 1869 it became necessary to obtain further sources of supply; and the Corporation acquired a site at Whiston, water from which was procured in 1871 at the rate of 1,000,000 gallons a day, whereas now the quantity was 544,000 gallons. In 1878 the town was almost in straits for water; and they succeeded in arranging with the Collinsgreen Colliery Company for a supply, which was then 900,000 gallons per day, but had now fallen to 630,000 gallons. The Corporation after this made up their minds to go in for a perfectly adequate supply; and from 1878 to 1882, they were casting about for a new source, with the result that two further pumping-stations were erected—one at Knowsley, which began working in 1886, producing 1,350,000 gallons per day, which had now fallen to 990,000 gallons; and one at Kirkby, which was opened two-and-a-half years ago, producing 1,500,000 gallons, and this was still maintained. At the present time, they had a supply of 4,250,000 gallons per day; but they must consider the possibility of a decrease at Kirkby, and of the supply becoming inadequate. The average consumption was 3,000,000 gallons a day; but on certain days it had been as much as 4,750,000 gallons. A breakdown at two of the smaller stations or at one of the larger ones would make the supply considerably less than the average daily consumption. On more than one occasion, owing to breakdowns, the supply to the whole of the town had been cut off for six or eight hours, which was a serious matter, especially in case of fire. The Corporation had every ground for believing that the increase in consumption would go on. In 1871, when the population was 45,000, the

consumption for the year was 283 million gallons, and in 1891, when the population was 71,000, the consumption was 1000 millions. All the necessary land had been purchased; and the total cost of the scheme was estimated at £75,000. The preliminary pumping experiments at Melling revealed a large and substantial supply. The nearest pumping-station was at Kirkby, 1¾ miles away; and the next nearest was the Southport Water Company's well, 2¾ miles distant, neither of which would be affected. The Water Engineer (Mr. M. F. Gaskin) confirmed the Town Clerk's statement, and said it was possible the private supplies of manufacturers would be failing, which would make a further increased demand on the Corporation supply. A protracted discussion took place between the Town Clerk and the representative of the Ormskirk Rural Sanitary Authority as to the terms on which the Corporation would supply them from the new source; and before the close of the inquiry, it was agreed that the charge should be 6d. per 1000 gallons, with a guaranteed supply of 5 per cent. on the total yield.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Falkirk Town Council are finding, as they proceed with the promotion of their scheme for acquiring, or rather assuming, the lighting of the burgh, that their path is beset with difficulties; but they do not seem to recognize that these are mostly of their own creation. There is undoubtedly force in the statement (not used in Falkirk) that public men must proceed upon professional advice. On the other hand, as is well known, professional gentlemen being called in, a wall is at once reared between the parties, over which negotiations have to be conducted in a hostile manner. This is the position the Councillors have landed themselves in. Had they carried out their first idea of concluding a friendly bargain with the Gas Company, they would by this time have seen their way clear. They did have a meeting with the Directors; but by putting forward conditions which were almost impossible, they cut off the possibility of coming to terms. Indeed, it is a question whether they have ever come within reach of the question of terms. The Directors are keeping quiet, which is a policy they are entitled to follow, seeing that the Committee of the Council have, in effect, rebuffed them. The Lighting Committee of the Council are endeavouring to follow the same policy, forgetting the great difference there is between them and the Directors. They are a majority of the Council; and having the power in their hands, they this week passed a remit of the whole subject to themselves, and placed the conduct of all correspondence in the hands of their Convener (Mr. Storey). This step was taken because of the desire of Mr. Storey to keep the position secret from several members of the Town Council, who have an interest in the Gas Company. Provost Griffiths is one who is excluded, because he held shares in the Company until this question arose, when, to show his honourable bearing, he sold them out. It certainly is a curiosity to have an important subject like this being negotiated, and the leader of the community shut out of it. I should say it would require very strong reasons for suspecting misconduct on the part of a public man, to justify what the Council have done. Mr. Storey is not the community of Falkirk; and he has no mandate to conduct the negotiations. It is the Council who have; and if the Council delegate their powers to one man, they are doing what looks like a thing which is incompetent, and which, if they were to lose, might lead to the individual members of the Council being held personally responsible for the costs. On Monday night, there was an opposing motion before the Council, to the effect that they should not proceed with their Bill until the Gas Company refused to come to terms. This was not a motion which could commend itself; and it was rightly rejected, because it would have played into the hands of the Gas Company. The proposal of the Provost, that they should consider the situation in private, was the only sensible one; but, for reasons given above, it was not entertained. Had it been adopted, and anything had leaked out which it was intended should not, public opinion in Falkirk is surely strong enough to reprobate such conduct. Even though it were to occur, the worst that could happen would be the passing of the Gas Company's Bill, under which the community would not be so much prejudiced as some make believe. Meantime, the Council is drifting to a Parliamentary Committee, while professing to be anxious to have a friendly settlement.

The Dundee Corporation Bill has now been revised. The sections which deal with the Gas Commissioners are from No. 30 onwards. Section 30 provides that the Town Council shall be the Commissioners for carrying the Gas Acts into execution, in place of the Commissioners constituted by the Dundee Gas Act of 1868. Section 31 provides that the business of the Dundee Gas Commissioners may be taken up and transacted at the meetings of the Town Council and its Committees; and shall be as valid and effectual as if made at separate meetings of the Town Council as Gas Commissioners. Annual meetings of the Gas Commissioners shall be held as required by the Gas Acts. Section 32 provides for the officers of the present Committee continuing in office, and for the separate office of Clerk to the Gas Commission ceasing to exist—the intention being that the duties shall be discharged by the Town Clerk. In section 33, power is taken to issue redeemable gas debenture stock.

A new feature, but not unlooked for, appears in the statistics as to the output of gas which were submitted to the Perth Gas Commission by the Manager (Mr. T. Whimster). These showed the output during November to have been 12,410,900 cubic feet—a decrease of 488,510 cubic feet upon the output in November last year. The illuminating power was of an average of 28·39 candles, which is from two to four candles higher than the average of previous months. These effects are due to the introduction of the oil-gas process. It follows that, with the provision of richer gas, the consumption falls off. The advantage, however, comes in in respect that a higher duty is got from the coal. Deducting the gas made from oil, the yield from coal amounted to 10,192 cubic feet per ton; that quantity including what might have been derived from the working up of the tar. The new process is thus likely to somewhat disturb figures in a matter of comparison.

At the Perth Gas Commission meeting on Monday, it was stated that complaints had been made by residents in the neighbourhood of the gas-works regarding offensive smells, which were experienced in consequence of bye-products from the works being allowed to flow in the open waterway known as the Canal Street Lade. In connection with these complaints, the Sanitary Inspector had served a notice on the Gas Manager, requiring that the overflow products should be removed from the lade, as a nuisance under the Public Health Act. The Gas Committee agreed to recommend to the Commission to lay a pipe from the works to the Tay, to carry away the overflow; and it was remitted to Mr. Whimster, along with the Sanitary Inspector, to prepare a specification for the pipe, with an estimate of the cost. At a subsequent meeting of the Committee, the matter was delayed. Bailie Cuthbert, at the Commission, moved that the pipe should be laid to the Tay, as suggested. Councillor Wright, Convener of the Gas Committee, moved delay, so that the Committee might have time to find out the cause of complaint, and if a remedy could be found without throwing away £200 in laying a pipe through the South Inch. Councillor Peter Reid moved that a Committee be appointed to arrange a mode of ventilation into a shaft at the works. Some of the members were afraid of fish in the river being destroyed by the discharge. Mr. Wright's proposal was adopted. The subject is a troublesome one; and it is aggravated by the fact that the Perth Gas-Works are so hemmed in that there is no room for adopting remedial measures. The Commissioners will require, in a few years, to face the question of transferring the works to a new site outside the city.

Mr. Cameron, who was recently returned to the Edinburgh Town Council, has signalized his entry into municipal life by an attempt to solve the difficulty which attends the lighting of common stairs. His effort is not in the direction pursued by others—that of framing regulations for the control of the services or duties of a community—but in the mechanical line. He has devised a lamp with a self-acting mechanical attachment for the raising or lowering of the light at the desired times. This arrangement will work for eight days without attention. Mr. Cameron showed his lamp to some of the Gas Commissioners and members of the Lighting Committee of the Town Council on Thursday night. What they thought of it, is not recorded; but whatever may be their opinion as to the ingenuity of the appliance (which, of course, is far from novel), there is a fatal objection to its adoption. The light is never extinguished, but is merely lowered. Suppose a windy evening, which afterwards becomes calm. The light would get blown out after it was lowered; and then there would be risk, almost amounting to certainty, of explosion when some early riser struck a light to re-light it. There is also the question of cost, which, in itself, is almost an insuperable barrier to its adoption.

The Paisley Gas Corporation seem to be waking up to a true sense of their duties, with reference to the funds connected with the gas undertaking. They have, thanks to the excellent management of Mr. G. R. Hislop, been able to carry on a policy of what is little less than plunder, to the neglect of the customary financial safeguards in the shape of sinking funds and the like. They are now considering a scheme under which a sum would be set apart annually which would be sufficient, with compound interest, to extinguish the debt of the Corporation in fifty years. The proposal is a welcome one, as it shows that the notion has at last entered the heads of some of the public men in the town that a gas undertaking's first and only duty is to itself, and has nothing to do with town improvements.

The melancholy duty falls to me this week to report the death of Mr. R. B. U. Thomson, Manager of the Broughty Ferry Corporation Gas-Works. Mr. Thomson, it will be remembered, on the 28th ult. sustained a severe accident to his left foot, by its being nipped by the piston-rod of the steam-engine. He was in a fair way to recovery; but about the middle of last week symptoms of blood poisoning were observed. He rapidly grew worse, and despite the best medical attendance that could be procured, he died on Sunday afternoon. It was only in the beginning of June last that Mr. Thomson entered upon his duties as Manager of the Broughty Ferry works, in succession to Mr. G. T. Myers, who then retired. Prior to his appointment to Broughty Ferry, he was assistant to his father, Mr. James Thomson, Manager of the Inverness Corporation Gas-Works. He was a young man of great talent, having had a distinguished career as a student, and unusually favourable opportunities for prosecuting practical study in mechanical engineering while in the service of the Highland Railway Company. Even in the short time he was engaged with the Broughty Ferry Corporation, he has done good work, and earned the esteem of the Municipality. This was shown by the fact that, on Monday night, at the monthly meeting of the Police Commission, Provost Orchar spoke feelingly of the sad circumstances under which they had met; and a resolution expressing sympathy with Mr. Thomson's relatives was adopted. Had Mr. Thomson lived, he was certain to have risen in his profession.

Events move rapidly. Mr. Thomson died on Sunday night; and on Thursday night, the Broughty Ferry Police Commission appointed Mr. Alexander Waddell, of Newtonards, Belfast, to be their Manager. Mr. Waddell, was the gentleman who stood in the final vote with Mr. Thomson when he was appointed in April last; and the Commissioners, very honourably, turned to him when the post so early and unexpectedly again became vacant. Mr. Waddell served in the Hamilton and Paisley Corporation Gas-Works; and he has been Manager at Newtonards since 1885. The record of his work is summed up in a minute by the Corporation Gas Committee of Newtonards, which states that since he went there there has been an increase of gas sold of 54 per cent.; that the increased production per ton of coal has been 20 per cent.; that the price of gas has been brought down from 7s. 6d. to 4s. 2d., with discounts; and that he had acted as Engineer as well as Manager, having planned and carried out all the alterations and extensions which were required. He is to take up his duties at Broughty Ferry on an early date.

Ashbin Refuse and Electric Lighting.—In connection with the Halifax Corporation electric lighting scheme, it is proposed to test the feasibility of generating steam for electric lighting and similar purposes with ashbin refuse as the only fuel. The power is obtained from Livet's expanding flue steam-generators, which, it is stated, are capable of exerting 260-horse power, when town's refuse is burned.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 16.

Sulphate of Ammonia.—Prompt parcels keep moving off readily; but there does not appear to be the same eagerness to purchase as a week ago. The cause thereof probably is that buyers expect an easier market, in consequence of the cessation of the Scotch strike. However, there will perhaps be a quiet market between now and the end of the year, as usual; but it appears very doubtful at the moment whether prices will give way at all, seeing that there are buyers for January-April at £13 17s. 6d., and May-September at £13 15s. Transactions of this kind make it perfectly plain that lower values in the near future need not be looked for. The price for spot lots is still £13 16s. 3d. The cheaper quotations emanate from second-hand sellers. Nitrate is firm and unchanged.

LONDON, *Dec.* 16.

Tar Products.—This market is somewhat easier. Larger quantities are being produced; and the pressure for delivery is being relieved. This is particularly so in the case of pitch, for which, it is reported, 30s. is being quoted; while as much as 28s. 6d. has been paid for spot delivery. There is every prospect now of this product being weaker. Ninety per cent. benzol is absolutely unsaleable; and the price quoted below is nominal. The time is coming when gas companies will have to consider whether they cannot help the tar trade by fortifying their gas by the use of benzol, instead of petroleum ether; benzol having been proved to be a much richer illuminator. Common tar oils are more freely offered; and the price is weaker. There is no change in the position of anthracene, excepting that the Tar Products Sales Committee have renewed their association for a further period. Tar, 15s. to 16s. Pitch, 26s. 6d. to 28s. Benzol, 90's, 1s. 5d.; 50's, 1s. 6d. Creosote, 1¾d. Creosote salts, 25s. Solvent naphtha, 1s. 4d. Toluol, 1s. 8d. Crude benzol naphtha, 30 per cent., 8d. Carbolic acid, 60's, 1s. 7d.; crystals, 6d. Cresol, 1s. 4d. Anthracene, 30 per cent., "A," 1s. 2d.; B," 10d.

Sulphate of Ammonia.—The price has fluctuated during the week between £13 12s. 6d. and £13 17s. 6d., less 3¼ per cent. Makers are firm at the latter price. There is an excellent demand, stocks are low, and, while the price may not be much further advanced, there is very little chance of it being lower for many months to come. Gas liquor is quoted at 8s. 6d. to 9s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—With the complete absence of stocks, and a fairly active demand for all descriptions of fuel, colliery proprietors are finding it difficult to keep up with their orders; and in many cases advances of about 6d. per ton are being obtained without difficulty for immediate delivery. The pressure is chiefly upon the better qualities of round coal, suitable for house-fire purposes. These are fetching 14s. to 15s., for best Wigan Arley; 13s. to 13s. 6d., for second qualities of Arley and Pemberton four-feet; and 11s. 6d. to 12s., for common house-fire qualities at the pit mouth. There is also a demand for steam and forge purposes fully equal to any supplies just now upon the market; and prices have stiffened up slightly in a good many cases—10s. 6d. to 11s. being about the average figure at the pit mouth, whilst for shipment 12s. to 12s. 6d. is being readily got for good Lancashire steam coal, delivered at the ports on the Mersey. Engine classes of fuel, so far as the better qualities are concerned, continue very firm at recent rates—burgy averaging quite 8s. to 8s. 6d., and good qualities of slack, 6s. 6d. to 7s. 3d. per ton at the pit. There are, however, more plentiful supplies of the lower descriptions of slack coming in from other districts at cheaper rates; so that there is some irregularity as regards the inferior descriptions of engine fuel, which can be bought at from 5s. 3d. to 5s. 9d. per ton. With regard to the proposed Sales Association, which was again discussed at a meeting of representatives of the leading collieries, held at Wigan last week, nothing has yet been definitely arranged; and there was evidently a strong feeling on the part of some of the representatives against attempting anything which would appear like coercion with regard to prices. It was stated in some cases that the objects of such an Association should not go beyond protecting colliery owners from unfair competition, and enabling them to compare notes with regard to prices quoted for the large contracts in gas coal, locomotive coal, and other descriptions of fuel for manufacturing purposes, which for the last two or three years have been cut down to such an unremunerative figure.

Northern Coal Trade.—There is still a very strong demand for coal, especially for steam coal, of which consumers abroad seem desirous of getting in larger stocks; and this, and preparation for the approaching holidays, causes the pits to be fully employed with a very limited amount of coal that is not contracted for. For this limited quantity, high prices are obtainable. To-day, the quotation for best Northumbrian steam coals is about 15s. per ton f.o.b.; whilst for contracts over next year, from 10s. 6d. to 12s. are the quoted rates that may be looked on as general. Second qualities of steam coals are about 1s. per ton less than best; and small steam coals are now more abundant, and may be readily had at 6s. per ton f.o.b. There is very little alteration in the demand for manufacturing coals; and supplies for the next year are being arranged at advances of from 6d. to 1s. per ton on those for this year's supplies. For gas coals, there has been extraordinary activity in the last few days. Those who had contracted have been endeavouring to obtain deliveries fully up to their contracts; and deliveries have been very large. About 10s. to 10s. 6d. may be looked upon as the current price for gas coal, for this year's delivery. The largest local contract—that of the Newcastle Gas Company—is now under negotiation. It will most likely be settled the day this appears in print; and the probability is that the prices that will be paid will be close upon 8s. per ton delivered. There will thus be an appreciable advance in price, but one that is justified by the prospect of the coal trade. Coke is firm generally, on the basis of 16s. per ton f.o.b. There has been of late a much larger demand for gas coke; and though the production is about at its highest, stocks have been brought very low. More is being exported to Italy, and to some Norwegian ports where this form of fuel is popular. The price for good gas coke for export may be put at about 11s. 9d. per ton now; but it is probable that next year the rate may be increased.

Scotch Coal Trade.—The strike among the miners having ended, the coal trade is rapidly assuming a normal condition. Stocks were, however, so low that deliveries are still uncertain, and prices have not yet quite returned to what they were before the trouble. The men are working steadily; and a week or two should see a great fall in prices. The quotations given are: Main, 9s. 6d. to 10s.; ell, 10s. 6d. to 11s.; splint, 10s. 6d.; and steam, 11s. 6d. to 12s. per ton f.o.b. Glasgow. The shipments for the past week were very low; the total having been 62,467 tons—a decrease of 22,988 tons upon the previous week, and of 79,773 upon the corresponding week of last year. For the year to date, the total shipments have been 7,313,961 tons—an increase of 18,385 tons upon the same period of last year.

The Cost of the Coal Strike at Widnes.—At the meeting of the Widnes Town Council last Tuesday, a report was presented by the Gas and Water Engineer (Mr. Isaac Carr) on the effect of the recent dispute in the coal trade on the gas and water undertaking. For the gas-works, 2850 tons of coal were purchased outside the contracts, at an average cost of 16s. 8½d. per ton, as against 6s. 10d. the contract price. The total extra cost of this coal was £1405, to which must be added £200 the estimated loss through the decreased consumption of gas; making the total cost of the strike £1600, or 2·82d. per 1000 cubic feet of gas sold. There was also a large decrease in the consumption of water owing to the stoppage of local works. The loss in revenue from this cause amounted to £1800, besides which there was an extra outlay of £814 for fuel—making the total loss on the water-works £2114. The loss on both works amounted to £3714.

Increases in the Price of Gas.—The Rochdale Corporation have adopted the recommendation of the Gas Committee to raise the price of gas by 3d. per 1000 cubic feet to all consumers from the next quarterly inspection of the meters. After the 25th inst., the Sowerby Bridge Local Board will advance their charge for gas by 3d. per 1000 cubic feet. By 20 votes to 5, the Walsall Town Council yesterday week resolved to advance the price of gas by 2d.; making it 2s. 8d. per 1000 cubic feet. The loss sustained by the coal strike, the Gas Committee estimated at £3500. Oswaldtwistle is added to the towns where the price of gas is increased in consequence of the strike; the price having been advanced from 2s. 8½d. to 2s. 11d. per 1000 cubic feet, with a discount of 2½d. At the meeting of the Mossley Town Council last Thursday, the minutes of the Gas Committee stated that they had decided to raise the price 3d. per 1000 cubic feet after the 25th inst. The Chairman (Alderman R. S. Buckley) mentioned that, owing to the coal strike, it had cost them more than £1000 extra for coal, &c.

The Sheffield Corporation and Compensation Water.—A meeting of the Associated Millowners on the Loxley, Rivelin, and Dun was held last Tuesday week, at Sheffield, to consider an application from the Water Committee of the Sheffield Corporation for the concession of the compensation water, in consequence of the unprecedented state of drought existing in the neighbourhood. The Water Engineer (Mr. E. M. Eaton) was present on behalf of the Corporation, who are the owners of several mills on the Rivelin; and he laid before the meeting a statement as to the condition of the reservoirs at the present time. He pointed out the urgent necessity there was for some concession to be made, in order to enable the Corporation to be sure of being able to continue a proper supply of water to the city should the drought extend through the winter. Mr. Eaton having retired, the millowners proceeded to discuss the whole question; and, in the end, resolved to allow the Corporation to retain one-quarter of the compensation water at present sent into the Loxley and Rivelin streams for such a period as they may require it, and subject to notice by either side to terminate the arrangement, the price to be 6d. per 1000 gallons. The Corporation Water Committee have since held a meeting, at which they passed a resolution expressing their opinion that the millowners' terms were so onerous as to be unacceptable. Correspondence on the question is, however, still proceeding; and the Water Committee are trying to obtain the consent of the millowners to the taking of the compensation water without charge on the days it is not required for the mills during Christmas week and to the end of January.

Sales of Shares.—Messrs. Baxter, Payne, and Lepper sold at Bromley last Thursday week 450 £10 shares in the *Bromley Gas Consumers' Company*, at prices ranging from £16 2s. 6d. to £16 17s. 6d. each. ——Messrs. Easton and Son lately sold, at Hull, 11 shares in the *Kingston-upon-Hull Gaslight Company*, at £64 each; and 13 shares in the *British Gaslight Company*, at £40 each.——Last week, £7000 of 4 per cent. stock of the *Fylde Water-Works Company* was sold by auction at the office of the Company, at Kirkham. It was offered in lots of £10, at a reserve price of £12 10s.; and the different lots realized from £12 10s. to £12 17s. each.——The second moiety of the £6000 required by the *Salisbury Gas Company* for the erection of a new gasholder and tank was raised on Thursday last, by the offering for sale by auction of 240 new ordinary 5 per cent. shares, of the nominal value of £12 10s. The first half was sold in a similar manner about a month ago (*ante*, p. 952), and realized a premium of £338. The prices were not so good on the present occasion; the whole of the lots, with the exception of one at £13 12s. 6d., going for £13 10s. per share, which represents an aggregate premium of £241.——A recent sale by tender of shares in the *Harrogate Gas Company* shows the confidence of investors in gas, notwithstanding the introduction of electricity as a competitive light. There were for disposal 312 new ordinary £10 shares (being the balance of the additional capital authorized to be raised a few years ago), for which a minimum price of £24 10s. each was fixed. Tenders were received for 477 shares; and the average price of those allotted was £25 9s. 2¾d.——Last Thursday, £5000 of new ordinary stock in the *Derby Gas Company*, entitled to a dividend not exceeding 5 per cent. per annum, was sold by auction at prices varying from 6 to 6½ per cent. premium.

New Water-Works for East Cowes.—The East Cowes Local Board have resolved to apply to the Local Government Board for permission to borrow £4000, for the purpose of carrying out a new scheme of water supply, which has been projected by Messrs. Lemon and Blizard, of Southampton.

The Supplementary Supply of Water for Leicester.—In the Chancery Division of the High Court of Justice yesterday week, Mr. Justice Kekewich sanctioned the contract, whereby the Leicester Corporation will obtain an extra supply of water from the Ellistown Colliery. The contract had been signed by the Trustees of the colliery, and sealed by the Corporation; but as the colliery is being carried on under the direction of the Chancery Division, the contract was subject to the Court's sanction. The Leicester Corporation, under this contract, have undertaken to make an annual payment of £500 for 30 years to the Trustees; the average daily supply of water expected to be derived from the colliery being 390,000 gallons.

Electric Lighting of Chatsworth House.—The Duke of Devonshire's Derbyshire residence, Chatsworth House, has just been lighted throughout by electricity. At the height of 400 feet above the house there is a lake about 9 acres in extent, to which a pipe was laid some years ago for the purpose of supplying water to the well-known "Emperor" fountain. This pipe has been tapped, and water power obtained for driving the electric lighting machinery. All the rooms in the mansion that are being used have been fitted with the new light in place of candles, which have hitherto been employed. The extent of the undertaking may be imagined from the fact that 3000 feet of pipe have been put in, together with 850 incandescent lamps, ranging from 6 to 50 candle power.

The Electric Lighting of Chelmsford.—The Chelmsford Town Council last Wednesday resolved to accept the offer of Messrs. Crompton and Co. to renew their contract for the lighting of the borough on the existing terms. A demand by the Board of Trade that the overhead wires should be placed underground was also discussed; and it was stated, on behalf of the Lighting Committee, that, while they recognized the advisability of adopting this order with regard to the principal thoroughfares, they did not consider the change necessary in the less-frequented roads. It was hinted that it was possible, if the Company were put to the heavy expense of doing this, it might result in the withdrawal of the electric lighting. It was determined that the matter should be left to the judgment of the Board of Trade.

Electric Lighting for Walsall.—The Walsall Town Council yesterday week adopted a report by the General Purposes Committee, in which they recommended that application be made to the Board of Trade for their approval of the system of electric lighting for the borough on the high-tension principle, with transformers. They also proposed that application be made to the Local Government Board for their sanction to a loan of £19,650, in addition to the suggested site at the Wolverhampton Street gas-works, for the cost of carrying out the scheme, and that contracts should be made as follows: With the Electric Construction Company, for the plant, for £10,003; with Messrs. Brunstead and Chandler, for the engines, for £1350; and with Messrs. Danks, for the boilers, for £805. The Mayor, referring to the matter, said if the Corporation did not at once do this work a private body could come in and undertake it. The Committee had given the most careful attention to the question; and he was satisfied that the installation they proposed was not going to do much injury to the gas undertaking.

The Electric Lighting Scheme for Stafford.—Colonel W. M Ducat, R.E., held an inquiry last Wednesday at Stafford respecting an application of the Corporation to the Local Government Board for sanction to borrow £20,000 for the purpose of electric lighting. The Town Clerk (Mr. M. F. Blakiston) explained that the Corporation obtained powers in 1890 to supply the electric light; but no further steps had been taken, as it was found that there was no immediate demand for it. At the end of 1892, however, the County Council applied to the Corporation for a supply of electric light to the new hall which they were erecting. This would give them a good customer for about 500 lights; and he had no doubt that others would soon follow when they started working. An estimate of the cost of an installation for present requirements had been made by the Corporation Gas Engineer (Mr. J. Ferguson Bell), and approved by Dr. Hopkinson, at £12,000. It was, however, thought advisable, in view of the very probable extension which would be required, to provide for this; and they therefore asked for a loan of £20,000. Dr. Hopkinson was called, and said he believed the extension indicated would be needed during the first year. He felt confident that a profit could be made from the works. Alderman W. Lloyd and Mr. Gibson (a member of the Council) spoke in opposition to the scheme. The Inspector afterwards visited the site of the proposed station.

The Price of Gas at Lytham.—In connection with the resolution of the Lytham Improvement Commissioners to increase the price of gas, to which reference was made in last week's JOURNAL, a rather remarkable difference of opinion is reported. The Gas Committee took the view that it was undesirable to raise the price until after the end of the present financial year; but when their minutes came before the Commissioners for confirmation, the opinion was expressed that it would be better to deal with the matter at once, and have done with it. Two of the members were in favour of an immediate increase of the price by 6d. per 1000 cubic feet, which would clear off the deficiency caused by the coal strike within the present quarter. In opposition to this, or to any immediate advance, it was argued that an arrangement had been entered into with consumers to supply gas at 3s. 4d. per 1000 cubic feet, that it would be dishonest after they had used gas for six weeks of the quarter, to tell them that they must pay a higher price for that which they had consumed, as well as for that which they would be consuming. The reply was that the public would naturally expect the increase in the cost of coal to be followed by an advance in the price of gas, and that there was no such direct compact with the consumers as would justify the use of the word "dishonest" being applied to any action of the Commissioners. In the end, it was decided, as already reported, that the price should be advanced by 4d. per 1000 cubic feet.

Patent Gas Producer Syndicate, Limited.—At a recent meeting of the shareholders in this Syndicate, it was unanimously resolved to wind up voluntarily; and Mr. J. H. Byrne was appointed Liquidator.

Messrs. R. and J. Dempster, Limited.—A Company has been registered under this title, with a capital of £100,000, in £10 shares, to acquire the business of gas engineers and contractors carried on by Messrs. R. and J. Dempster at Newton Heath, Manchester.

Dover as an Oil Port.—The Dover Harbour Board have just concluded arrangements with an oil company for the erection on the quays of large oil reservoirs, which are to be constructed by next summer, when oil tank-steamers will make Dover a depôt for the South of England, and run regularly between there and Russian and American ports.

Kingsbury Water Scheme.—The Local Government Board have come to the conclusion that the water scheme for Kingsbury, to carry out which the Tamworth Rural Sanitary Authority recently applied for sanction to borrow £5000 (see *ante*, p. 770), is not a suitable one; and they suggest that the Authority should take into consideration the desirability of admitting the whole of the parish to the benefit of a supply from the Tamworth Water-Works.

Dublin Water Supply.—The Dublin Corporation Water Committee, in the early part of last week, came to the conclusion that the state of the reservoir at Roundwood warranted them in relying upon that source for the supply of the north side of the city, without having to introduce the unfiltered water of the Royal Canal. The works for conveying the water from this latter source, which were very nearly completed, have therefore been abandoned for the present.

The Gouthwaite Reservoir of the Bradford Corporation.—In connection with their Gouthwaite reservoir, a tender for the construction of which was accepted last July (see *ante*, p. 44), the Bradford Corporation last week agreed to the purchase of 700 acres of land for £13,850. They only require about 62 acres; but the sum asked for this was £10,000; and there would have been a good deal of difficulty with regard to the severance of various rights, and interference with right of way. Besides this, there is a valuable bed of stone on the property, which will be very useful in the execution of the works which the Water Committee have in hand.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1122.)

Issue.	Share	When ex-Dividend.	Dividend on Ord. or Div. on Bonds.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Oct.	10½	Alliance & Dublin 10 p. c.	10	16–17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c	10	11¼–12¼	..	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	106–108	+4	4 12 7
100,000	20	14 Dec.	8	Bahia, Limited	20	10–11*	..	14 10 10
200,000	5	15 Nov.	6¼	Bombay, Limited	5	5–5¼	..	5 18 2
40,000	5	,,	6¼	Do. New	4	3¾–4¼	..	6 2 6
380,000	Stck.	16 Aug.	11½	Brentford Consolidated	100	220–225	..	5 2 2
180,000	,,	,,	8½	Do. New	100	163–168	..	5 1 2
220,000	20	15 Sept	11½	Brighton & Hove Original	20	41–43	..	5 6 11
888,500	Stck.	31 Aug.	5	Bristol	100	102–105	..	4 15 3
320,000	20	29 Sept.	11¾	British	20	41–43	–1	5 4 8
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19–20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	15–16	..	5 6 3
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	5¾–6¼	..	3 1 6
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	98–101	..	5 18 10
150,000	20	13 July	8	Cagliari, Limited	20	27–28	..	5 14 3
550,000	Stck.	13 Oct.	12½	Commercial, Old Stock	100	244–249	..	5 0 4
165,000	,,	,,	9½	Do. New do.	100	187–192	..	4 19 0
160,762	,,	14 Dec.	4½	Do. 4½ p. c. Deb. do.	100	125–130*	+2½	3 9 3
800,000	Stck.	14 Dec.	13	Continental Union, Limited	100	228–233*	+4½	5 11 6
200,000	,,	,,	10	Do. 7 p. c. Pref	100	193–198*	+5	5 1 0
535,000	Stck.	15 Sept.	5	Crystal Palace Ord. 5 p.c. Stk	100	100–105	..	4 15 3
486,090	10	28 July	10	European, Limited	10	22–23	..	4 6 11
354,060	10	,,	10	Do. Partly paid	7½	15–16	+½	4 13 9
5,646,590	Stck.	16 Aug.	12	Gaslight & Coke, A, Ordinary	100	226–230	–4½	5 4 4
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	97–102	..	5 18 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	275–280	..	3 11 ·5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	125–135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	185–190	..	3 18 11
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	173–178	..	3 18 7
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	270–275	..	3 12 9
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	161–169	..	3 11 0
1,061,150	,,	14 Dec.	4	Do. 4 p. c. Deb. Stk.	100	127–130*	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	130–135*	+½	3 6 8
908,000	,,	,,	6	Do. 6 p. c. do	100	175–180*	+1	3 6 8
3,800,000	Stck.	15 Nov.	12	Imperial Continental	100	213–218	–2	5 10 1
75,000	5	14 Dec.	6	Malta & Mediterranean, Ltd.	5	4½–5*	..	6 0 0
560,000	100	2 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	106–108	+1	4 12 7
541,920	20	15 Nov.	5	Monte Video, Limited	20	12¼–13½	..	7 8 2
150,000	5	30 Nov.	8	Oriental, Limited	5	6¾–7¼	..	5 10 4
60,000	5	29 Sept.	7	Ottoman, Limited	5	4–4½	..	7 15 6
166,870	10	—	2	Pará Limited	10	1¾–1¾	..	—
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	98–102	..	5 17 8
500,000	100	1 Dec.	6	2nd Do.	100	96–100	..	6 0 0
150,000	10	13 Oct.	5	San Paulo, Limited	10	8½–9½	..	5 5 3
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	307–312	+3	4 19 4
1,350,000	,,	,,	12	Do. B do.	100	243–248	+1	4 16 10
260,000	,,	,,	13	Do. C do.	100	253–258	+1	5 0 9
750,000	,,	13 July	5	Do. 5 p. c. Deb. Stk.	100	148–152	..	3 5 9
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	210–215	..	5 7 0
				WATER COMPANIES.				
745,967	Stck.	29 June	10	Chelsea, Ordinary	100	270–275	..	3 12 9
1,720,252	Stck.	13 Oct.	8	East London, Ordinary	100	208–213	..	3 15 1
544,440	,,	29 June	4½	Do. 4½ p. c. Deb. Stk.	100	145–150	+6	3 0 0
700,000	50	14 Dec.	8½	Grand Junction	50	109–112*	..	3 15 10
708,000	Stck.	16 Aug.	11	Kent	100	285–290	..	3 15 10
1,043,800	100	29 June	9½	Lambeth, 10 p. c. max.	100	240–245	..	3 17 7
406,200	100	,,	7½	Do. 7½ p. c. max.	100	199–204	..	3 13 6
310,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	128–131	..	3 1 0
500,000	100	16 Aug.	12½	New River, New Shares	100	345–350	..	3 9 3
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	132–135	..	2 19 3
902,300	Stck.	14 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	154–158*	+1½	3 15 11
126,500	100	,,	6	Do. D 7½ p. c. do.	100	144–145*	+1½	4 1 0
1,155,066	Stck.	14 Dec.	10	West Middlesex	100	263–267*	+3½	3 14 10

*Ex div.

A Mishap to a Gasholder at Raunds.—During the terrific gale which prevailed in the middle of last week, the village of Raunds, in Northamptonshire, was plunged into darkness through an accident to the gasholder. This unfortunately occurred just after dusk on Wednesday; and it was not expected that a supply of gas would be again available before Friday evening or Saturday.

Mr. Southern on the Working of the Manchester Gas Undertaking.—Mr. J. W. Southern has had pointed out to him an error in his "Memorandum on the Working of the Manchester Gas-Works," which we gave in the JOURNAL last week. The price of Manchester gas was put at 2s. 7d. instead of 2s. 6d. per 1000 cubic feet. The error, he says, is purely one of transcription, and does not affect any of the arguments or conclusions, which are based on the correct figure.

The Utilization of Town Refuse for Electric Lighting at Harrogate.—After considering a report by Mr. G. Wilkinson, who was called in to advise them, the Harrogate Corporation have decided to carry out an installation of the electric light for a defined area of the town. It is estimated that the works will cost £12,000; and the annual earning capacity of the installation at 7d. per unit is put down at £2333. The annual working expenses if the plant is running continuously are computed at £2234; but if worked at night only, the profits are estimated at £500 per annum. The Corporation have also resolved to utilize the town refuse for generating the electricity; and it is proposed to adopt apparatus devised by Mr. S. Smithson, of Heckmondwike, for the sorting and combustion of refuse.

Stealing Gas at Sheffield.—At the Sheffield Police Court last Tuesday, Benjamin Harrison, was fined 40s., or, in default, 14 days' imprisonment, for stealing a quantity of gas belonging to the Sheffield Gas Company. It appeared from the evidence that the gas-meter was removed from defendant's house some two years ago, in consequence of his account not having been paid. Their suspicions being aroused, two of the Company's officials, with a police constable, visited the house on the 1st inst., and discovered gas burning in one of the rooms; and the defendant's wife admitted that she had connected the service and outlet pipes, with the full knowledge of her husband. It was found that the joint had been made by means of putty and rag; the whole being bound round with wire.

The Proposed Board of Conciliation for the Coal Trade.—Mr. B. Pickard, M.P., President of the Miners' Federation of Great Britain, speaking at Barnsley last Friday night, said much fear had been expressed that the proposed Board of Conciliation for the settlemeut of disputes in the coal trade would never be formed. He said distinctly that it would, and would act for twelve months. There would be no stoppage of work in February, as the miners of the Federation would work on. They would continue their fight for a living wage; but he would not say what the minimum would be. Mr. T. Ratcliffe Ellis, Secretary of the Coalowners' Association, has written to the Speaker of the House of Commons, on behalf of the Joint Secretaries of the Conciliation Board, asking him to appoint a Chairman to the Board, under the arrangement lately come to.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

HYDRAULIC AND GAS ENGINEERS, BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

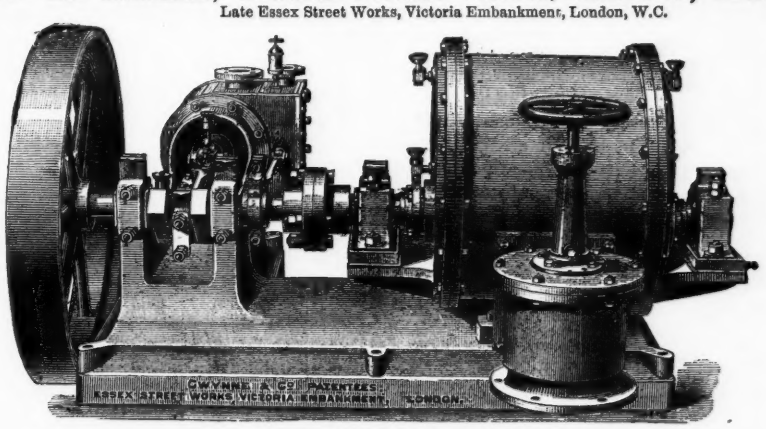
Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.

Late Essex Street Works, Victoria Embankment, London, W.C.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

CHRISTMAS HOLIDAYS.

ALL INSTRUCTIONS and COPY FOR ADVERTISEMENTS for the next issue of the "JOURNAL" should be received at the Office *not later* than THE FIRST POST ON FRIDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

VOLCANIC Fire Cement (Winkelmann's)
Fire Resistance 4500° Fahr.
ANDREW STEPHENSON, Sole Agent, 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield; AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. II., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

MR. J. C. CHAPMAN, Fellow of the Chartered Institute of Patent Agents, advises on all matters connected with LETTERS PATENT FOR INVENTIONS and the PROTECTION OF TRADE MARKS, &c., at home and abroad. Preliminary Information and Handbook on application.
70, Chancery Lane, LONDON, W.C.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

LIQUOR, Tar, and Spent Oxide wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

G. L. LAMBERT, 26, Alberta Terrace, Nottingham. Consultations, Advice, Reports in Various Branches of **Practical** Mechanical Engineering and Machinery. **Specialities** in Water, Sewage, and Gas Plant Making. **Surveyor** of Steam-Ships, Marine Engines, Boilers, and General Machinery. **Detailed Inspection** of Engineering Contracts during Manufacturing and Erection.

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.

JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

CHARTERING, FORWARDING, AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See last week, p. 1069).

Telegrams: "HUTCHINSON BROS., BARNSLEY."

WANTED, a Situation as Working Gas MANAGER, or any place of trust. Used to Engine and Exhauster. Good Smith and Fitter. Thoroughly conversant with the whole routine of Gas Manufacture and Distribution. Nine years in present Situation. Health of Family cause of change.

Address No. 2315, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Tar Stillman, to take charge of a small Tar Distillery. State age, experience, and wages required.

Address No. 2314, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Gas-Works in the Midland Counties, a thoroughly competent MAIN LAYER.

Applications, stating age, experience, &c., to be made, by letter, to No. 2312, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good Gas-Fitter, well up in all kinds of Fittings, either private or public. A permanent Situation to a steady Man.

Apply, as under, stating age and salary required, with copies of testimonials, to No. 2310, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Working Foreman for the Cape Town Gas-Works. Must be thoroughly experienced in Retort Work and Carbonizing, and possess a practical knowledge of all Gas Apparatus. Young Man preferred. Small House provided. Wages to commence £3 per week. No overtime allowed.

Apply to Mr. JAMES A. KELMAN, Secretary, Cape Town and District Gaslight and Coke Company, Limited, 251, WINCHESTER HOUSE, E.C.

ASSISTANT Wanted in a Factory in the Provinces, Draughtsman, practical knowledge of Wet and Dry Meters, Governors, Retorts, Purifiers, Exhausters, and Gas Apparatus generally. Able to devise improvements, get out catalogues, correspond, &c.

Address, stating experience in full, age, and salary expected, No. 2311, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, the Manufacturing of an Article in the Gas Trade by a Manufacturer of Sheet-Iron Ware in Germany.

Apply to Z.L. 1106, care of Samuel Deacon and Co., 150 and 154, Leadenhall Street, LONDON, E.C.

WANTED (new or second-hand), the following BOOKS and PAMPHLETS: (1) "Gas Consumer's Manual," by R. A. Melsom. (2) "The Use of Gas," by Joshua Kidd. (3) "Mason's Gas-Fitter's Guide." (4) "Colburn's Gas-Fitter's Guide." (5) "Gas Economy," by Ferrier. (6) "Gas and All about It: A Gas Consumer's *Vade Mecum*." (7) "Coal Gas: Its History, Manufacture, and Use." (8) "Campbell's Gaslight Manual: A Treatise on the Management of Coal Gas, as Applied to Domestic Purposes."

Address No. 2313, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WALTON-ON-THE-NAZE GAS-WORKS, ESSEX.

TO BE SOLD OR LET,

For Removal or Occupation, including the Mains as laid, and the convenient walled-in Yard, situated in Station Road.

THE Works may be viewed on appli- cation to the Foreman, James Francis, on the Premises; and, if satisfactory arrangements are effected, possession may be had early in January, 1894.

The Stock of Coals, Lime, Tubing, &c., to be taken at Valuation.

Offers to be addressed to the *pro tem.* Secretary of the Tendring Hundred Water-Works Company, 35, Bloomsbury Street, London, W.C.; but the Directors will not be bound to accept the highest or any Offer.

Dec. 1, 1893.

ALWAYS a Buyer of Spent Oxide, Tar, and AMMONIACAL LIQUOR.

Apply to J. HARDMAN, Milton, STAFFORDSHIRE.

TO GAS AND WATER COMPANIES AND MANAGERS.

AN ASSOC.M.INST.C.E. having an ex- tensive experience in GAS and WATER WORKS' DESIGN and ERECTION, now Chief Assistant in a large Gas-Works and Engineer to several small ones, having designed and erected a THREE HUNDRED and a ONE HUNDRED MILLION GAS-WORKS complete, besides several small ones, also ENLARGED many other Works, including NEW LIFTS to EXISTING GASHOLDERS, REGENERATIVE SETTINGS, &c., would be pleased to VISIT WORKS and ADVISE on their EXTENSION or ALTERATION, making SPECIFICATIONS, DRAWINGS, ESTIMATES, and superintend erection if desired.

SPECIALITIES.

Any EXTENSION or ALTERATION to GAS or WATER WORKS. ASSESSMENT of Gas-Works. New HOLDERS, TANKS, ROOFS, PURIFIERS, or FILTER-BEDS. TELESCOPING or adding FRESH LIFTS to EXISTING HOLDERS. REGENERATIVE SETTINGS, for SMALL GAS-WORKS, without Excavations. SAVING 20 PER CENT. in first cost, renewals, and working.

Address "Boz," 9, Gracechurch Street, LONDON, E.C.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS from Ironfounders, Gunbarrel Manufacturers, Timber Merchants, Druggists, Ropemakers, &c., for GOODS to be delivered on the Company's Works, Great Brunswick Street, in such quantities as may be required from time to time up to the 31st of December 1894.

Samples of Goods required are open to inspection on the Works, Great Brunswick Street, and printed lists of articles required can be had on application at the Company's Offices, D'Olier Street.

Tenders, endorsed "Tender for Stores," to be lodged in my Office on or before the 27th inst.

W. F. COTTON,
Secretary and Manager.

D'Olier Street, Dublin,
Dec. 11, 1893.

CORPORATION OF LEICESTER.

CAST-IRON PIPE CONTRACT.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the supply and delivery of the necessary CAST-IRON PIPES and CONNECTIONS, from 2 inches to 24 inches in diameter, required during the Twelve Months ending the 31st of December, 1894.

Specification and Form of Tender to be obtained from the Engineer.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices, not later than Eleven o'clock a.m., on Saturday, Jan. 6, 1894.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
Dec. 12, 1893.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS.

Specification, Quantities, and Form of Tender can be obtained from the Engineer.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Jan. 6, 1894.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
Dec. 12, 1893.

WALLASEY LOCAL BOARD.

NEW GAS-WORKS.

TO ENGINEERS, IRONFOUNDERS, AND MAKERS OF GAS PLANT.

THE Wallasey Local Board invite TENDERS for the supply, delivery, and erection of MOUTHPIECES, HYDRAULIC MAINS, and other FITTINGS to Retort-Benches, also IRON FLOORING to Retort-House.

Copy of the Specification may be obtained on application to the Engineer, Mr. H. Ashton Hill, Assoc.M.Inst.C.E., at the Gas and Water Works, Great Float, near Birkenhead. A charge of One Guinea will be made for copy of Specification, to be returned on receipt of a *bonâ fide* tender.

Sealed tenders, on the form provided for the purpose, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Retort-Bench Mountings," to be delivered at my Office, as below, not later than Five o'clock p.m. on Monday, the 22nd of January, 1894.

The Contractor will be required to enter into a bond, with approved sureties, for the due performance of the contract, which contract and bond will be prepared at the expense of the Contractor.

The Board do not bind themselves to accept the lowest or any tender.

By order,
W. DANGER,
Clerk to the Board.

Public Offices, Egremont, Cheshire,
Dec. 14, 1893.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 815, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.

Head Office: MIDDLESBROUGH. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER, LINCOLN."

THE Incandescent Gas-Light Company, Limited, whose Registered Office is at 14, Palmer Street, Westminster, hereby give public notice that the LETTERS PATENT granted to HANS HIRSCHFELD, dated 1893, No. 2689, for an invention entitled "Improved Incandescent Mediums for purposes of Illumination," will, if put into practice, be a direct INFRINGEMENT of the LETTERS PATENT vested in the Incandescent Gas-Light Company, Limited, dated 1885, No. 15,286, 1886 No. 3592, and 1887 No. 11,195; and that the Incandescent Gas-Light Company, Limited, are prepared to take Legal Proceedings against any person putting the said Invention, the subject of the Letters Patent, granted to the said Hans Hirschfeld, dated 1893, No. 2689, into practice.

FAITHFUL AND OWEN,
Solicitors.

11, Victoria Street, Westminster, S.W.

BANDON TOWN COMMISSIONERS (CO. CORK).

TENDERS are invited for the supply of about 200 tons best double-screened GAS COAL, to be delivered, free on Rail, Cork, at per ton. The name and quality of the Coal to be specified in the tender.

Tenders, endorsed "Tender for Gas Coal," to be forwarded to the Bandon Town Commissioners, by Noon on the 22nd inst.

The Commissioners do not bind themselves to accept the lowest or any tender.

By order,
JOHN M'DONNELL,
Town Clerk.

Gas-Works, Bandon,
Dec. 15, 1893.

ROCHDALE CORPORATION.

TO RETORT MAKERS AND OTHERS.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of such quantities of RETORTS and other FIRE-CLAY GOODS, as may be required (exclusive of the new Works) during the Year ending Dec. 31, 1894.

Forms of Tender and any further Information may be obtained on application to Mr. T. B. Ball, the Manager at the Gas-Works.

Tenders, endorsed "Fire-Clay Goods," must be sent in to me not later than Noon on Wednesday, Dec. 27, 1893.

By order,
ZACH. MELLOR,
Town Clerk.

Town Hall, Rochdale,
Dec. 16, 1893.

SOUTH METROPOLITAN GAS COMPANY.

£25,000 Five per Cent. Perpetual Debenture Stock of the above Company, presenting an Investment of the soundest description.

MESSRS. G. A. WILKINSON & SON are instructed by the Directors to SELL BY AUCTION, at the Mart, on Monday, Jan. 8, at Two o'clock precisely, in numerous lots, to suit large and small purchasers, £25,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK of the South Metropolitan Gas Company.

The districts supplied by the Company comprise nearly the whole of the South of London, from Wandsworth to Plumstead Marshes; and the demand has so much increased that the supply of Gas has been nearly doubled within the last Ten Years.

Particulars may be had of FRANK BUSH, Esq., Secretary of the Company, No. 709a, OLD KENT ROAD; of Messrs. BUDD, JOHNSONS, AND JECKS, Solicitors, 24, AUSTIN FRIARS; and of Messrs. G. A. WILKINSON AND SON, Surveyors and Auctioneers, 7, Poultry, CITY.

HORNSEY GAS COMPANY.

NOTICE is hereby given, that the TRANSFER BOOKS, so far as they relate to the Four Per Cent. Debenture Stock, WILL BE CLOSED on Saturday, the 23rd inst., until Saturday, the 30th inst., both dates included; and the Interest for the Half Year will be payable on the 1st of January next.

S. J. WILLIAMS,
Secretary.

Chief Office: 63, Chancery Lane, W.C.,
Dec. 16, 1893.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that the TRANSFER BOOKS of the Company, so far as the Debenture Stock only is concerned, WILL BE CLOSED on and from the 23rd of December, 1893, until the 3rd of January, 1894, both days inclusive.

By order,
WALTER CROMARTY,
Secretary.

Offices: North Street, Wandsworth, S.W.

Now Ready, Cloth Bound, Price 3s. 6d., Post Free,

THE ROYAL COMMISSION on the METROPOLITAN WATER SUPPLY.

— 1892-3. —

Report of the Evidence (reprinted from the JOURNAL), with Comments on the Inquiry, and the Commissioners' Conclusions and Recommendations.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

TO RETORT & FIRE-BRICK MANUFACTURERS.

THE Corporation of Bury are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at their Gas-Works.

Forms of Tender may be obtained from Mr. W. H. S. Gendall, Gas Engineer, Gas-Works, Elton, Bury.

Tenders, sealed and endorsed "Tender for Retorts," &c., to be sent to me not later than Monday, the 25th day of December, 1893.

JOHN HASLAM,
Town Clerk.

Bury, Dec. 8, 1893.

MOUNTAIN ASH LOCAL BOARD.

TAR AND LIQUOR.

THE Local Board invite Tenders for the surplus TAR and for the AMMONIACAL LIQUOR produced at their Gas-Works, Penrhiwceiber, for One Year ending Dec. 31, 1894.

For further Information, apply to Mr. John Williams, Surveyor, Town Hall, Mountain Ash.

Tenders to be endorsed "Tender for Tar" or "Tender for Ammoniacal Liquor," as the case may be, and sent to H. P. Linton, Esq., Town Hall, Mountain Ash, on or before One o'clock on Monday, the 1st day of January, 1894.

The Local Board do not bind themselves to accept the highest or any tender.

Now Ready, Price 15s., Limp Cloth, the Thirteenth Yearly

ANALYSIS OF THE ACCOUNTS OF THE Metropolitan Water Companies,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the year ended December 31, 1892, or March 31, 1893, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the year ended December 31, 1892.

Compiled and arranged by

ALFRED LASS, F.C.A.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
B Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

For FIRE-BRICKS, the most durable for GAS-FURNACES,

ADDRESS

JAMES WHITE & Co., Limited,

ALBERT WORKS, WIDNES.

COKE BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

For Exhauster Advertisement, see last week.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, E.C.,
And at STROUD, GLOUCESTERSHIRE.

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

11, BAY STREET, PORT GLASGOW.
Telegrams: "HUNTER PORT GLASGOW."
Established 1872.

NIDDRIE CANNEL

A FIRST-CLASS CANNEL COAL,

Yielding a large volume of rich Gas, and fully 60 per cent. of first-class Coke.

FOR ANALYSIS, PRICE, AND ALL OTHER PARTICULARS, APPLY TO

The Niddrie & Benhar Coal Co., Ltd.,
15, HANOVER STREET,
EDINBURGH.

Telegrams: "BENHAR, Edinburgh."

T. B. KITTEL, SHEFFIELD.
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.

Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**

The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

ALEX. C. HUMPHREYS, M.E.,
General Superintendent & Chief Engineer,
The United Gas Improvement Company, U.S.A.

A. G. GLASGOW. M.E.,
Late General Inspector,
The United Gas Improvement Company, U.S.A.

HUMPHREYS & GLASGOW,

Contracting Engineers for Water Gas Plant,
9, Victoria Street, London, S.W.

AUG. KLÖNNE,

DORTMUND (GERMANY).

REGENERATIVE FURNACES.

Unsurpassed in Efficiency, Economy, Durability, and Easy Working.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.,

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,
FITTER.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY

Strongly recommended where EXCESSIVE HEATS have to be maintained.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

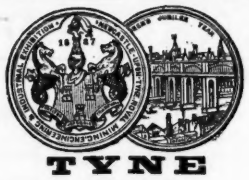
London Office:

90, CANNON STREET, E.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,

for

CANNEL & COAL.



TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·86 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 Candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C

IRISH OXIDE OF IRON.

GAS PURIFICATION.

RIKY'S OXIDE (formerly worked by Messrs. Stanley and Olphert).

THE LARGEST SUPPLY OF OXIDE IN HAND OF ANY OTHER FIRM IN THE WORLD.

Purity and Uniformity of Quality Guaranteed.

RIKY AND CO. can supply the above at a much lower rate than any other firm in the trade, being owners of the property where it is found. *No Middleman* or *Agent* receives a profit.

SAMPLE AND PRICE ON APPLICATION.

Address **JOHN RIKY AND CO., Killygordon, County Donegal; and 103, Great Brunswick St., Dublin.** Telegrams: "RIKY, KILLYGORDON."

ARROL-FOULIS

Patent Automatic Machinery

FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

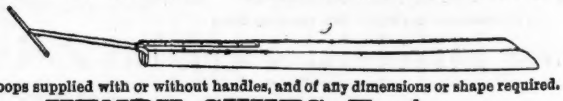
GLASGOW.

See Illustrated Advertisement, p. II. Centre of JOURNAL for Dec. 5.

STEEL SCOOPS

FOR

RETORT CHARGING.



Scoops supplied with or without handles, and of any dimensions or shape required.

HENRY SYKES, Engineer,

66, BANKSIDE, LONDON, S.E.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

CLAYTON, SON, & CO.

LIMITED,

LEEDS,

LONDON OFFICE, 63, QUEEN VICTORIA STREET, E.C.

MAKE

RETORT LIDS

OF ALL FORMS AND SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on application.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.
For Prices and Particulars, apply to
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

CAST-IRON PIPES
FOR GAS AND WATER.
Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.
VALVES
FOR GAS, WATER, AND STEAM.
TELEGRAMS: "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

TELEGRAPHIC ADDRESS: "ROBUSTNESS, LONDON." EXCHANGE TELEPHONE 1756.
GASEOUS FIRING
FOR LARGE OR SMALL
RETORT-SETTINGS
PLANS, SPECIFICATIONS, AND ESTIMATES SUBMITTED.
SPECIALTIES
J. & H. ROBUS,
20, BUCKLERSBURY, LONDON, E.C.
ENGINEERS & CONTRACTORS
FOR THE ERECTION OF GAS AND WATER WORKS COMPLETE, AND FOR EXTENSIONS AND RENEWALS.

"YEADON"
REVOLVING GAS-RETORTS
(YEADON AND ADGIE'S PATENTS)
FULL PARTICULARS AND ESTIMATES GIVEN BY
THE YEADON GAS-RETORT SYNDICATE, LIMITED,
4, ALBION PLACE, LEEDS;
Or their Sole Representatives: D. M. NELSON & SONS, 68, Bath Street, GLASGOW.

GASHOLDERS

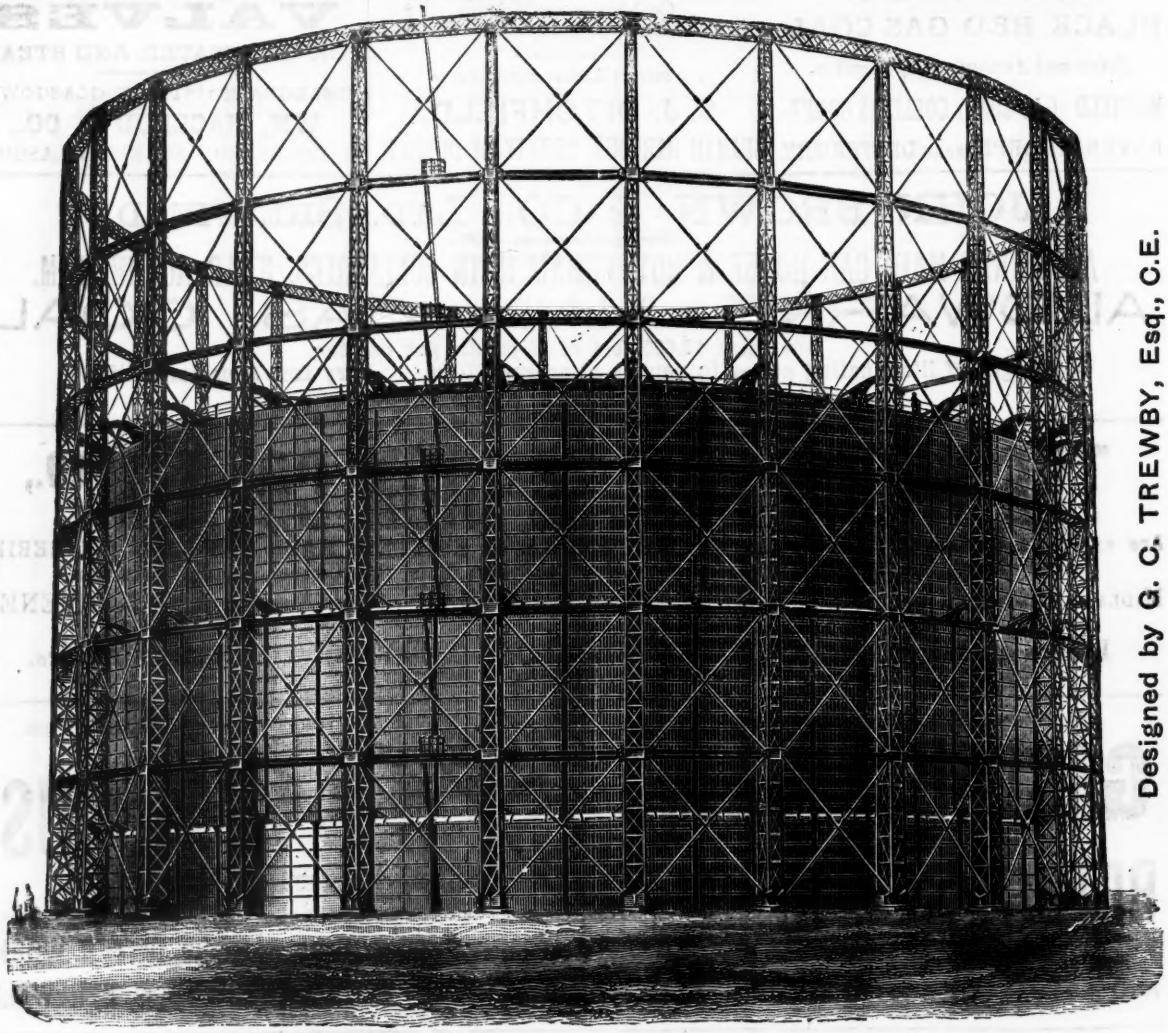
C. & W. WALKER,

MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE;

10, Finsbury Square, London.

"FORTRESS DONNINGTON, SALOP." "FORTRESS LONDON."—Telegraphic.

Constructed by C. & W. WALKER.



Designed by G. C. TREWBY, Esq., C.E.

Four-Lift Gasholder, nearly 200 feet high, and 8 million Cubic Feet capacity, recently erected by us for The Gaslight and Coke Company, London.

PURIFYING MACHINES.

PURIFIERS. SULPHATE PLANT.

Weck's Centre-Valve.

PURIFIERS WITH PLANED JOINTS

OF WHICH

C. & W. WALKER

ARE THE

INVENTORS AND FIRST MAKERS.

THEY HAVE ERECTED THEM IN LARGE NUMBERS and of the GREATEST MAGNITUDE THROUGHOUT the UNITED KINGDOM, and in all PARTS of the WORLD; and they are UNIVERSALLY ADMITTED to be the BEST and STRONGEST OF ALL PURIFIERS, and the MOST MODERATE in COST.

C. & W. WALKER, MIDLAND IRON-WORKS, DONNINGTON, SHROPSHIRE.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS

Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
C X C	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, ST. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICE, APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT

R. & J. DEMPSTER,

GAS PLANT WORKS,

NEWTON HEATH, MANCHESTER.

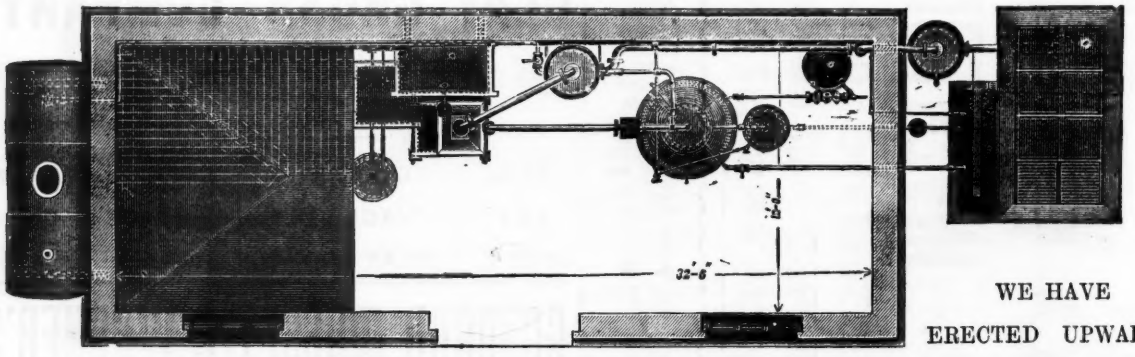
PATENT SULPHATE OF AMMONIA PLANTS

FOR PRODUCING WHITE SALTS FROM PYRITES ACID.

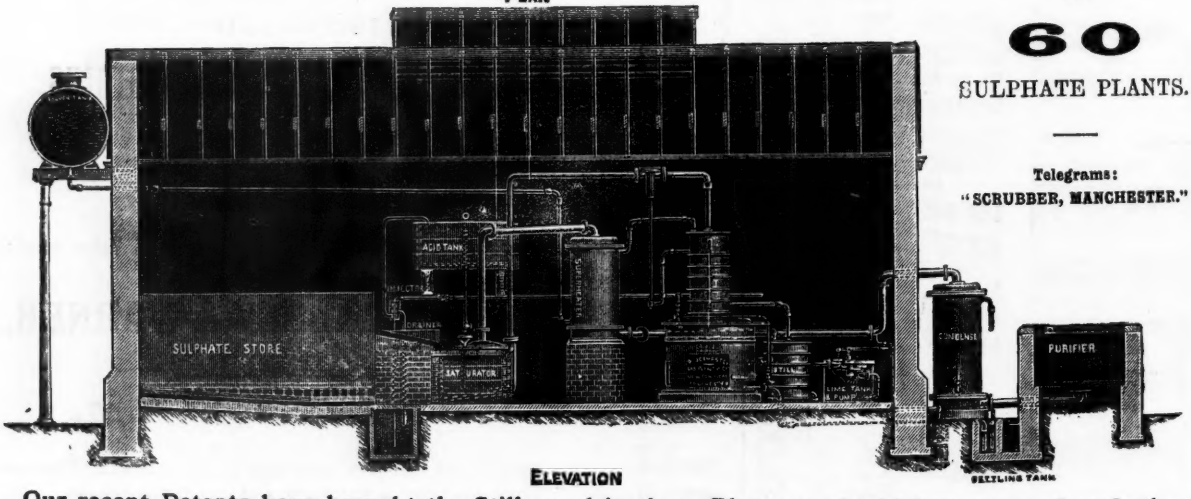
"Splendid Results"—32 lbs. of Sulphate per ton of Coal.

(See "Register of Patents," JOURNAL OF GAS LIGHTING for Nov. 14, 1893.)

In addition to a number of these Plants already at work, FIVE complete Plants are on order for early completion.



PLAN



ELEVATION

WE HAVE ERECTED UPWARDS OF

60

SULPHATE PLANTS.

Telegrams: "SCRUBBER, MANCHESTER."

Our recent Patents have brought the Stills used in these Plants to the highest state of perfection; and they are superior to any in the market. They are so constructed that the trays or compartments may be easily cleaned, and, if necessary, the hoods removed, without taking the Still to pieces. A large quantity of Liquor can be worked off quickly without loss of Ammonia. Very little Steam is required; and the Plants may be worked continuously or let down at night. They occupy little space, and are worked without any danger to the attendant. The first cost is small; and in construction they are strong and durable. They are approved by the Government Inspectors, and guaranteed not to cause any nuisance.

We can adapt our Improved Patent Stills to work with existing apparatus at small outlay, compared with the increased production of Sulphate.

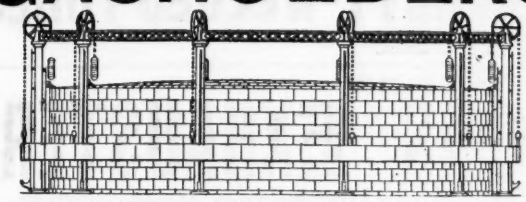
ESTIMATES AND ILLUSTRATIONS ON APPLICATION.

London Office: **181, GRESHAM HOUSE, OLD BROAD STREET, E.C.**

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

HENRY BALFOUR & CO.,
LEVEN, FIFE,
MAKERS OF
GASHOLDERS



PRESSURE-REGULATORS FOR GASHOLDERS (See "JOURNAL" Dec. 20 1892.)
FOUR-WAY VALVES,
AND ALL CLASSES OF GAS APPARATUS.
HENRY PUPLETT, 47, Victoria Street, S.W.

The Climax of Regenerative Gas Lighting!!

THE
"VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England by
HENRY GREENE & SONS,
153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.
PARTICULARS AND PRICES FREE. AGENTS WANTED.

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.
RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

WILSON CARTER & PEARSON,
GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.
ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

THE THAMES BANK IRON CO.
UPPER GROUND STREET, LONDON, S.E.,
SUPPLY FROM STOCK
CAST-IRON RETORTS
AND ALL KINDS OF GAS-WORKS APPARATUS.
SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.
Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.
AGENTS FOR
ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

THE DEIMEL GAS-LAMP.

Absolutely the Cheapest, Simplest, and most Economical Lamp before the Public.

Price of **Bracket Lamp, from 13s.**

Suitable for Suspension, or can be fixed to the ordinary Bracket in place of Burner.

Price of **Suspension Lamp, from 21s.**

Consumption 6 and 9½ cubic feet respectively.

Proprietors: THE DEIMEL LIGHT COMPANY, LIMITED,
86, GRAY'S INN ROAD, W.C. **Works: PORTPOOL LANE.**
LIBERAL DISCOUNT TO GAS COMPANIES.

J. & W. HORTON
ETNA WORKS,
SMETHWICK,
NEAR BIRMINGHAM
(Established 50 Years),
PATENTEES
AND
MANUFACTURERS
OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of
Gas Apparatus,

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

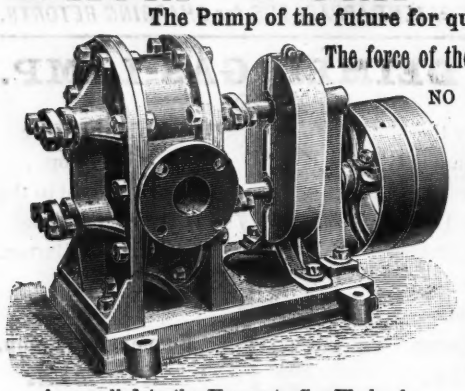
JOHNSON'S PATENT

DRUM PUMP AND GAS EXHAUSTER.

The Pump of the future for quickly and economically moving large bodies of Water.

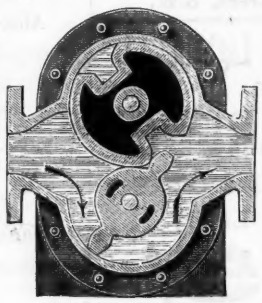
The force of the Piston Pump with the capacity of the Centrifugal combined.

NO SLIDES OR FRICTIONAL WORKING PARTS.

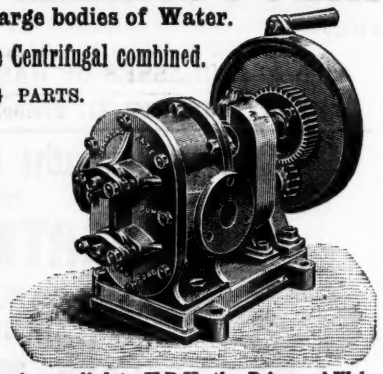


As supplied to the Harrogate Gas-Works for Pumping Gas Liquor.

NO PRIMING.



NO VALVES.



As supplied to H.R.H. the Prince of Wales for Pumping Gas Liquor at his Sandringham Gas-Works.

DRUM ENGINEERING COMPANY,

Hydraulic and Pneumatic Engineers, **55, ATHOL ROAD, BRADFORD.**

CLAPHAM BROTHERS, LIMITED,

ESTABLISHED 1837.

The most efficient Machine known for extracting Ammonia and other Impurities from Coal Gas is

KEIGHLEY, YORKS.

WELLINGTON, NELSON, & MARKET ST. WORKS.
Telephone No. 235,
Telegraphic Address: "CLAPHAM BROTHERS Keighley."

Laycock and Clapham's Patent.

The Patent Wooden Balls thoroughly break up the Gas; give an immense amount of freshly-wetted Surface; and do not clog or increase back pressure.

Whilst the Gas is passing through and amongst the Balls, it is continually showered upon by the contents of Buckets.

The Shaft Revolves in Improved Bearings, and all Workings are accessible.

REPAIRS AND TROUBLE REDUCED TO A MINIMUM.

MAKERS OF

PURIFIERS,

With Lutes Cast and Planed Joints,

CONDENSERS,

VALVES,

MAINS,

RETORT-FITTINGS.

London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Dec. 19, 1893.